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Tense, Aspect and Temporal Homogeneity

Fabrizio Arosio

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Fabrizio Arosio : Tense, Aspect and Temporal Homogeneity

TENSE, ASPECT AND TEMPORAL HOMOGENEITY

Von

Fabrizio Arosio

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When I arrived in Tübingen I had no idea that my life would change so radically in the coming few years. I married and I had children, but more surprising, considering my procrastinating nature, is the fact that I managed to write a dissertation. In these years, the most I learnt about semantics was from the discussions between Arnim von Stechow and Graham Katz in Arnim's car while we were driving across the Switzerland in search of a high peak to climb. These mountain trips were an accelerate and intensive class of semantics for the old student I was. Some sections of the present dissertation have been discussed in the candlelight in a mountain hut with these two exceptional scholars and friends. Towards the end of my time in Tübingen, while I was busy being a father, climbing peaks and discussing about semantics, my colleagues finished very long and excellent dissertations. When the family decided it was time to go back to Italy I decided it was time to finish.

There are a number of people who helped me in developing the ideas presented in this dissertation. I am deeply indebted to Arnim von Stechow and Graham Katz who helped me in finding a comprehensible story out of my primitive intuitions about temporal homogeneity; in this dissertation there is much of their work which is not explicitly acknowledged. I am thankful to Orin Percus who critically discussed some chapters of the dissertation and helped me in giving order to some of the more obscure sections. Thanks to Magdalena Scheiner for her helpful comments about tense selection and habitual meanings. Thanks to Teresa Guasti and Janina Rado who gave me important hints for the empirical work of chapter 4. Thanks to Marco Cicchini who helped me with the Matlab cryptography. This dissertation has also benefited from conversations with Uli Sauerland, Andrea Bonomi, Sandro Zucchi and Gennaro Chierchia. I am thankful to the people of the whole SFB441 project and from the Seminar für Sprachwissenschaft in Tübingen; a particular *grazie* to Winnie Lechner who helped this old student to understand syntax.

Whilst sitting in my office in Tübingen, working on this dissertation, I was hit by the September 11 attack like everybody else in the world. Dramatic times have followed, which have been characterized by two wars that killed thousands of innocent people in Afghanistan and Iraq. It would have been a failing for me not to remember this human tragedy here and give a sincere message of peace. This message is much more important than tense, aspect and temporal homogeneity.

ABSTRACT

This dissertation investigates the semantics of tense and aspect in natural language sentences. Its goal is to develop a compositional, model-theoretic semantics for tense and temporal adverbs which is sensitive to aspectual distinction, with a clear syntax-semantics interface, with wide empirical coverage, for a number of different languages. My analysis will be mainly concerned with tense and aspect in Romance languages. In the discussion, I will argue that if we look at the durative adverbial distribution and the aspectual contrasts across the different morphological tense forms, we discover that the homogeneity character of the tense complement plays a fundamental role in tense selection in Romance languages. In order to explain these facts, I will assume that tenses are sensitive to the temporal homogeneity of their complement in Romance languages. I will bring some additional evidence to the hypothesis that the temporal homogeneity of the tense complement plays a fundamental role in tense selection in other domains such as habitual and generic meanings and state of result constructions. I will give an analysis of some facts from these domains. In order to develop the proposal in a model-theoretic framework, in chapter 1 I will discuss some of the accounts of tense and aspect and I will present a temporal architecture of tensed sentences which is sensitive to aspectual distinction and verb classes differences. In chapter 2, I will illustrate and formalize the "homogeneity" proposal. In chapter 3, I will explore the extension of the proposal to English. Finally, in chapter 4, I will integrate the linguistic introspective facts discussed in this dissertation with data from an empirical experiment in order to confirm my initial hypothesis concerning tense forms and adverbs combinations in Italian.

Tense, Aspect And Temporal Homogeneity

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1 TENSE, ASPECT AND VERB CLASSES

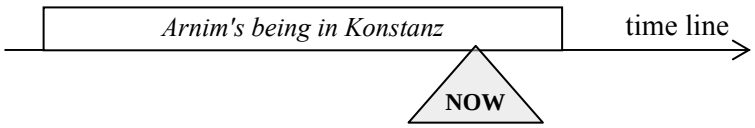
In this chapter I will critically but not exhaustively discuss some of the many accounts of tense, aspect and verb classes (Aktionsart) in order to provide a consistent and compositional architecture of the temporal system of a number of different languages for the proposal I am making in this dissertation. I will argue that, in order to compositionally derive the temporal meaning of natural language sentences we should look at the semantics of the main components involved in this process not in isolation but rather in interaction with each other. I will argue that we have to look at these grammatical categories in interaction with each other because the explicit definition of the semantic contribution of one of these is qualified by the implicit definition of the semantic contribution of the others. This idea is found in recent work by Stechow (2002), Musan (2001) and Kratzer (1998), who argue that we have to look at the entire architecture of the temporal interpretative mechanism in order to formally derive the correct truth conditions of a tensed sentence. However, these analyses do not pay full attention to the role of the aspectual class of the predicate in the temporal interpretation. In this chapter I will discuss some arguments for adding this missing piece to the temporal architecture proposed by these authors. I will argue that the distinction between state verbs and non state verbs plays an important role in the truth conditions of a tensed sentence and I will claim that this distinction is not a purely semantic distinction but it is concerned with the logical syntax and the argument structure of predicates. Following Herweg (1991) and Katz (2000), I will assume that state predicates denote properties of times while event predicates to denote properties of events. This idea will be formalized in a temporal system analogous to the one proposed by Stechow (2002), Musan (2001) and Kratzer (1998) in which tense is a referential expression and aspectual operators below tense are responsible for the aspectual meaning of the sentence. In order to support the assumption of a referential analysis of tense, I will examine three general approaches to the analysis of tense: a Priorean approach, in which time is represented in the metalanguage as a temporal index of evaluation and tenses are propositional operators, a quantificational approach in which time is directly represented in the object language and tense is a propositional operator which existentially closes the temporal argument of a given sentence, and finally a referential approach, in which time is directly represented in the object language and temporal variables carrying presuppositions saturate the temporal argument of a predicate. I will discuss some of the serious and well known problems that a tense logic account presents by considering the interaction of tense with temporal adverbials and logical operators and we will see that a development of the

Priorean approach that adequately copes with these problems has much of a referential approach by introducing indexical hidden adverbials (cfr. Bennett & Partee (1972) and Cresswell (1973) proposals discussed in 1.1.1). I will show that even a quantificational approach, in which tense introduces existential quantification on times in the object language, cannot avoid some of the above difficulties. Thus I will argue that a referential approach avoids most of the scope and adverbial interaction problems, it requires some implicit assumptions concerning the different temporal interpretations of predicates from different verb classes, which a quantificational approach also requires. I will point out that these implicit assumptions are required because the contribution of tense is not defined by taking into consideration the explicit contribution of aspect and verb classes. This is the motivation for having aspectual projections in our temporal system. In the discussion about aspect we will see that an account of aspectual distinctions only based on event properties (Giorgi & Pianesi, 2001) is not tenable and that an analysis based on the notion of point of view is too general to capture the explicit contribution of aspect. Following the recent work of Klein (1994), Kratzer (1998), Musan, (2001) and von Stechow (2002), I will assume that "aspectual" operators located below tense are responsible for the aspectual meaning of a sentence. I will argue that aspectual operators play a crucial role in the derivation of the different temporal interpretations conveyed by state sentences and non-state sentences; I will give an analysis of these differences. At the end of the chapter I will formalize the temporal architecture I will assume and will account for some interesting English facts concerning the differences in the temporal interpretation of state sentences and event sentences.

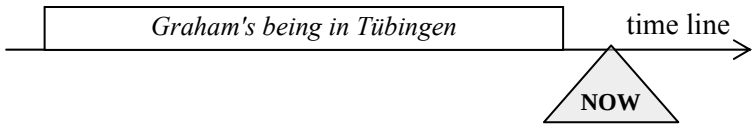
1.1 Tense

Natural language sentences show a systematic grammaticalization of temporal relations. In languages such as English, for example, tense morphemes born by the verb inflexion convey the information that the described eventuality[1] is localised in the past or in the present with respect to the time at which the sentence is uttered. Intuitively, a present tense sentence like (1).a describes a situation as it is at the time at which the sentence is uttered, while a past tense sentence like (1).b describes a situation as it is at a time before the time at which the sentence is uttered

(1) a. Arnim is in Konstanz



b. Graham was in Tübingen



In (1)a.-b. a difference in the tense inflexion is responsible for the different temporal meaning conveyed by the two sentences. But, what is tense?

1.1.1 Tense logic approaches

One of the most fruitful approaches to the study of tense in natural language is the tense logic approach, which finds its roots in the ancient tradition of temporal logics (see Øhrstrøm and Hasle (1995)). According to modern tense logic, invented in the '50s by the New Zealand philosopher Arthur Prior (1957, 1967) and further developed according to the laws of intensional logic (Carnap (1947) Kripke (1959)), the denotation of a formula is relativized to a time and tenses are sentential operators shifting the denotation of a formula into the past or into the future. The general idea is that given a propositional language L, its tensed counterpart will be obtained by adding to L the tense operators P and F by application of the following syntactic rule: if ϕ is a formula then Pϕ and Fϕ are formulae. A model for a propositional tensed language will include a structure T representing the linearly ordered set of times and a function υ assigning to each propositional letter of L its intension (in this case a function from times to truth values); a function of interpretation $\| \ \|$, which gives us recursively the interpretation of a well formed formula of L, will be relativized to the structure T, to the function υ and to a time $i \in T$ in the following way:

(2) If ϕ is a propositional letter, then $\| \phi \|^{T,\upsilon,i} = 1$ iff , $\upsilon(\phi)(i) = 1$ and in the usual way for the formulas obtained by application of the logical constants of L.[2]

Accordingly, the past and the future operators, which shift the truth condition of an *untensed*

[1] With the term *eventuality* I will generally refer to different types of situations (see Bach (1986)).

[2] In the original Priorean definition, T is an ordered set of instant of times. As Bennett & Partee (1972) showed this is a problem when we evaluate sentences such as "John built a house" since the building of a house takes more then an instant (we will ignore this problem at the moment and we will discuss it in the next sections). For the sake of the argumentation we will assume than in the definition in (2) sentences are evaluated with respect to times and with the term times we will refer to instant and intervals of times. Given a set of instants of time T, I is an interval of T iff $I \subset T$ and for every $t_1, t_3 \in I$ such that $t_1 \leq t_3$, if there is a t_2 such that $t_1 \leq t_2 \leq t_3$, then $t_2 \in I$.

formula to a different temporal index, are defined in the following way

(3) If ϕ is a formula, then $\| P\phi \|^{T,\upsilon,i} = 1$ iff there is some $i' \in T$ such that $i' < i$ and $\| \phi \|^{T,\upsilon,i'} = 1$; $\| P\phi \|^{T,\upsilon,i} = 0$ otherwise.

(4) If ϕ is a formula, then $\| F\phi \|^{T,\upsilon,i} = 1$ iff there is some $i' \in T$ such that $i < i'$ and $\| \phi \|^{T,\upsilon,i'} = 1$; $\| F\phi \|^{T,\upsilon,i} = 0$ otherwise.

The application of the tense logic semantics to the analysis of tense in natural language sentences has been realised in many different ways starting from the work of Montague (1974), Dowty (1979) and Kamp (1971). The basic idea is that the past tense morphology in a sentence like

(5) Graham lived in Tübingen

is the spell-out of the Priorean temporal operator P. Hence, the logical form (henceforth LF) of (5) will be something like

(6) P[Graham live in Tübingen]

where the temporal operator P applies to the untensed sentence *Graham live in Tübingen*. According to the definition of the past operator given in (3), its truth conditions will be

(7) $\| P[\text{Graham live in Tübingen}] \|^{T,\upsilon,i} = 1$ iff there is a time i' such that $i' < i$ and $\| \text{Graham live in Tübingen} \|^{T,\upsilon,i'} = 1$.

Definition (7) says that the sentence *Graham lived in Tübingen* is true at a time *i* iff there is a time *i'* before *i* at which the untensed sentence *Graham live in Tübingen* is true.

Summing up, the tense logic approach is characterised as follows

(i) sentences are evaluated with respect to a temporal index
(ii) the tense operators correspond to the tense morphemes
(iii) present tense sentences are untensed
(iv) tense is a sentential operator

(v) tense introduces existential quantification over times

(vi) tense manipulates times in the meta-language

(vii) tense introduces a new evaluation time, and the original one is lost

There are a number of well known problems with this approach that are relevant to our discussion. The first concerns the fact that, while evaluating a tensed sentence, we introduce a new evaluation time and we loose the original one. This is a problem when one tense is in the scope of another, as originally observed by Kamp (1971)

(8) A child was born who will become ruler of the world

A Priorean analysis can't capture the intended meaning of (8) given its associated LF below

(9) P [a child be born [F who become ruler of the world]]

According to (9), the *becoming ruler of the world* event is in the future with respect to the past time introduced by the matrix past tense. This is not correct. In order to capture the right interpretation of (8), the embedded '[F who become ruler of the world]' has to be evaluated with respect to the speech time, and not to the new evaluation time introduced by the higher 'P'. The LF in (9) captures rather what the following says

(10) A child was born who would become ruler of the world

As recently pointed out by Kusumoto (1999) (and less recently by Ladusaw (1977) and Dowty (1982)), we have the same problem when a past tense occurs in the scope of another past tense

(11) Hillary married a man who became the president of the US (*from Kusumoto, 1999*)

(12) Who hired the person who wrote this article? (*from Kusumoto, 1999*)

According to the Priorean analysis, the events described in the matrix clause follow the ones described in the embedded, but a 'forward-shifted' interpretation, namely an interpretation in which the events described in the matrix clause are before the ones described in the embedded clauses, is clearly available to the two sentences.

Kamp (1971) proposes a two dimensional system to solve the problem of the loss of the original evaluation time in the derivation of the truth conditions of the sentences above. In his system, sentences are evaluated with respect to two temporal indices: the first index is the Priorean evaluation time which can be shifted by the temporal operators, the second keeps track of the value that the first index has when the sentence is initially interpreted. Moreover Kamp introduces an operator *N* which sets the value of the first index to the value of the second one. According to these assumptions the semantics of tenses will be defined as follow

(13) a. $||P\ \alpha||^{T,\upsilon,t,t'}=1$ iff there is a time t'' such that t''<t and $||\alpha||^{T,\upsilon,t'',t'}=1$

b. $||F\ \alpha||^{T,\upsilon,t,t'}=1$ iff there is a time t'' such that t''>t and $||\alpha||^{T,\upsilon,t'',t'}=1$

c. $||N\ \alpha||^{T,\upsilon,t,t'}=1$ iff $||\alpha||^{T,\upsilon,t',t'}=1$

The correct LF for (8) will be therefore

(14) P [a child be born[N [F who become ruler of the world]]]

The embedded future is now correctly evaluated with respect to the speech time since the operator N sets the evaluation time back to speech time before the embedded sentence is evaluated. The correct truth conditions for (11) and (12) are obtained in the same way by the occurrence of the N operator above the embedded past operator.

As observed by Vlach (1973)[3], a two dimensional system is not powerful enough to capture the expressivity of natural language since we have sentences that need to keep track of more than one time. Consider the following example from Kusumoto (1999)

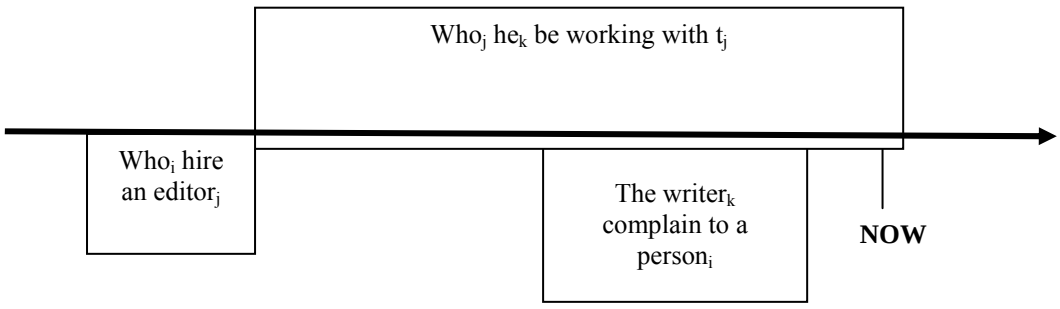
(15) The writer complained to a person who hired an editor who he was and still is working with.[4]

The temporal order of the described eventualities according to most natural interpretation of (15) is the one represented in the picture below

[3] Vlach's(1973) original observation is that we cannot represent the correct truth conditions of the following sentences in Kamp's double index system

(i) One day, all persons alive then would be dead

[4] Kusumoto (1999): 18.



Ignoring the contribution of the progressive which is not relevant to our discussion, the LF of (15) according to a Priorean simple approach will be something like

(16) P[The w. c. to a p. [P who h. an e. [P who he work with] & [he still work with]]]

According to the Priorean truth conditions of tense, (16) does not capture the temporal order we represented in the picture above since the past *working with* event is required to be before the time of the *hiring*.

According to a two dimensional system one possible LF of (15) can be something like

(17) P [The w. c. to a p. [P who h. an e. N [P who he be] and [he still be work. with]]]

According to (17), the past *working with* event is required to be before the speech time, but this is not enough according to what (15) says. The problem with (15) is that the past operator in [P who be working with] should be evaluated with respect to the past time introduced by the main clause past operator (which is in turn the evaluation time of the first intermediate clause). In order to cope with this problem we need to introduce a third temporal index (namely the evaluation time of the first intermediate clause) to be potentially recorded by the interpretative mechanism and an additional operator similar to N which sets the evaluation time of [P who be working with] to this index. That is to say that, in order to account for (15), we need a three dimensional system since we need to keep track of the intermediate evaluation time introduced by the first past tense operator. Clearly, since in natural language we can have sentences requiring a potentially infinite number of intermediate evaluation times, we need a potentially infinite dimensional system as showed by Cresswell (1990), and

this would amount to a high complexity to the interpretative mechanism. [5]

One alternative solution to this problem is to assume that the embedded tense in (8), (11) and (12) moves out of the scope of the matrix tense by mean of quantifier raising in order to escape the affection of the matrix tense Ogihara (1989, 1996) as below

(18) [a man who became the president of the US]$_i$ Hillary married t_i

As we can see from (18), the past tense in the relative clause is no longer in the scope of the matrix past tense and can be interpreted with respect to the speech time and not with respect to the time introduced by the matrix tense.

As pointed out by Kusumoto (1999), the raising account requires a number of extra ad hoc assumptions when considering sentences containing negative polarity items (NPIs) or sentences showing island effects. Consider the following sentence where the NPI *anybody* occurs in a past tense relative clause

(19) None of our sales people sold insurance to anybody who was on the plane[6].

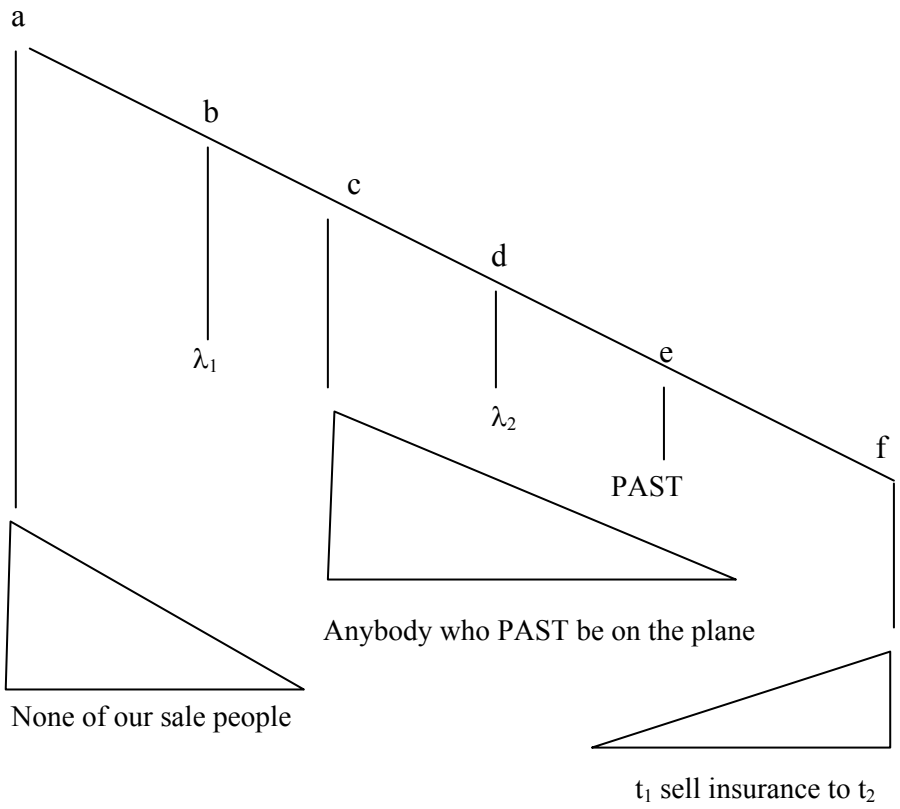
When uttered after a plane crash, (19) has as its most natural interpretation the one for which the *being on the plane* is after the *selling insurance* event. If we move the relative clause out of the scope of the matrix tense in order to obtain this reading, the result is that the negative polarity item is no longer in the scope of the negative element, as show below

(20) [anybody who was on the plane]$_i$ None of our sales people sold insurance to t_i

In order to cope with this problem one could say that the relative clause moves above the matrix tense into a position which is below the subject of the matrix clause as represented below

[5] See Kusumoto (1999) for a detailed discussion. The original example from Cresswell stating this point is "There will be times such that all persons now alive will be happy at the first or miserable at the second".
[6] Kusumoto (1999).

(21)



According to (21), the NPI *anybody* is in the scope of the subject of the main clause though the relative clause has been moved above the matrix tense to get a later than matrix interpretation. As Kusumoto observes, this explanation does not work for sentences like

(22) I tried not to hire anybody who put on a terrible performance.[7]

In (22), if we move the relative clause above the matrix tense to obtain a later than matrix interpretation, the NPI *anybody* is no longer in the scope of the negative element (which in this case is negation). In a raising account, an ad hoc and complicated process of reconstruction is therefore required in order to account for the distribution of negative polarity items. Moreover, consider the following sentence with *wh*-island

(23) Katy asked whether every Kennedy brother at the party kissed most female astronauts who later landed on the moon.[8]

[7] Kusumoto (1999)

As Kusumoto observes, the relative clause should move out of a *wh*-island in order to get a later then matrix clause interpretation. This requires that movement in temporal interpretation should not be subject to island constraints either.

In this first part of the discussion of the Priorean analysis of tense, we have seen that if on the one hand the assumption of a potentially infinite dimensional system that accounts for the interpretation of tense in relative clauses is discussable for economy reasons, a raising account requires tense movement not to be sensitive to some syntactic constraints. In order to cope with these problems, Kusumoto (1999) has recently proposed an analysis of tense in embedded contexts in which tenses are decomposed in a temporal variable, that is spelled out by the tense morpheme born by the verb, and a temporal operator, that existentially closes the temporal variable by requiring the time denoted by this latter to be in a certain relation with the speech time. We will not discuss Kusumoto's proposal since it is mainly concerned with the interpretation of tense in embedded contexts.

As Cresswell (1973) and Dowty (1982) pointed out, a Priorean analysis cannot account for the interaction of tense and temporal adverbials such as *yesterday* in sentences like

(24) John left yesterday.

A natural way to analyse the semantics of *yesterday* in a Priorean system is to define this adverbial as a sentential operator as below

(25) $\| Y\phi \|^{T,v,i} = 1$ iff there is a time i' on the day before the day including i such that $\| \phi \|^{T,v,i'} = 1$.

Given (25), two are the possible LFs for (24)

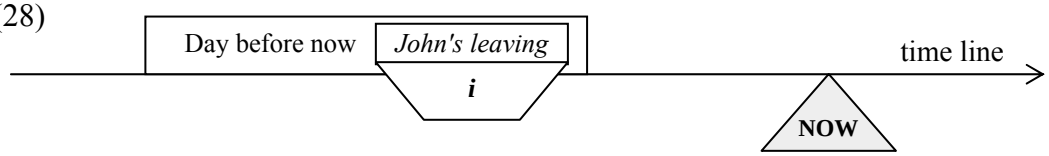
(26) P[Y[John leave]]

(27) Y[P[John leave]]

But neither (26) nor (27) represents what (24) means. Sentence (24) means in fact that there is a time in the past, let us say *i*, at which John left and that this time is on the day before the day including the speech time as represented in the picture below

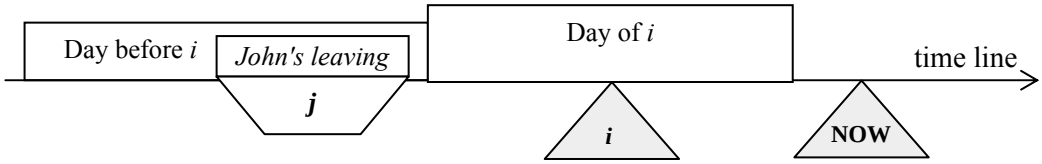
[8] Kusumoto (1999).

(28)



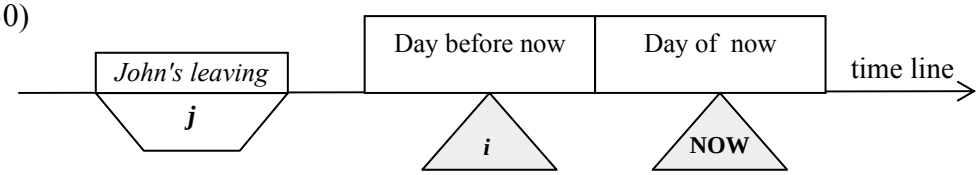
On the contrary, what (26) means is that there is a time *i* before the speech time for which there is another time *j* which is on the day before the day including *i* at which John left, as represented in the picture below

(29)



This doesn't give us that *John's leaving* is on the day before the speech time. On the other hand, (27) means that that there is a time *i* on the day before the day including the speech time for which there is another time *j* before it at which John left, as represented below

(30)



In this case *John's leaving* is only required to be in the past with respect to a time which is in yesterday. In order to cope with this problem (among many others), Kamp (1971) proposes that in his two dimensional system adverbials such as *yesterday* are not scope sensitive, but are indexical operators requiring their arguments to be true at a time which is on the day before the day including the context of utterance. As we have seen, in Kamp's system sentences are evaluated with respect to two temporal indices: the first index is the Priorean evaluation time which can be shifted by temporal operators, the second keeps track of the value that the first index has when we start to interpret the sentence. Given the definitions in (13), the semantics of *yesterday* is defined as follows

(31) $\| Y\phi \|^{T,\upsilon,i,i^*} = 1$ iff there is a *i*' included in the day before the day including *i** for which $\| \phi \|^{T,\upsilon,i',i^*} = 1$, where *i** stands for the context of utterance introduced in the

semantic model as a distinguished interval.

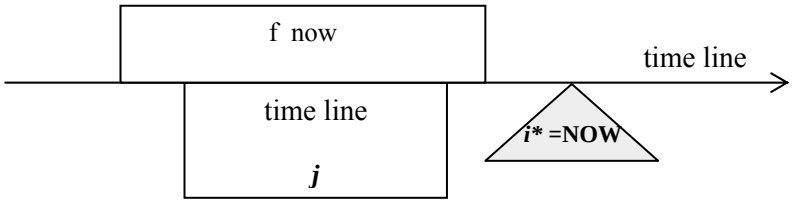
The LF and the truth conditions of (24) will be therefore

(32) || P[Y[John leave]] || $^{T,\upsilon,i,i^*}$ = 1 iff there is a $j < i$ such that

|| Y[John leave] || $^{T,\upsilon,j,i^*}$ = 1 and this is true there is a i' included in the day before the day including i^* such that || ϕ ||$^{T,\upsilon,i',i^*}$ = 1

Correct, as you can see from the picture below

(33)



According to this proposal, we have, however, to stipulate that tense should always have scope over the adverbial in order to get the right results. This is clearly an unnatural stipulation. Additionally, if you look at (32) we find a more serious problem with this proposal: tense doesn't play any semantic role in determining the truth conditions of sentence (24), as originally observed by Bäuerle (1979). In fact, according to (32) the Y operator requires the embedded sentence to be true at a time before the speech time and the application of P becomes vacuous. This, as Bäuerle notes, implies that a sentence like

(34) John will leave yesterday
LF: F[Y[John leave]]

has the same truth conditions as (24).

In order to cope with these problems, Bennett and Partee (1972) propose that in sentences like (24) and (34), the contribution of tense is to be defined together with that of the temporal adverbial. According to their proposal, this is done first, by restricting the class of frame temporal adverbials (like *yesterday*) which can combine with a certain tense by means of the following two grammaticality conditions

(35) *John left α* is grammatical only if there exists a moment of time *p* such that if it is

considered to be the present moment, α refers to an interval of time I such that there exists a subinterval of I, I', such that I' < *p*

(36) *John will leave* α is grammatical only if there exists a moment of time *p* such that if it is considered to be the present moment, α refers to an interval of time I such that there exists a subinterval of I, I', such that I' > *p*
where α is a frame adverbial such as *yesterday* or *tomorrow*,

then by giving the following truth condition of a tensed sentence like (24)

(37) *John left* α is true at interval of time I if and only if I is a moment of time, α refers to an interval of time I' and there exists a subinterval of I', I'', such that I'' [<]I and *John leaves* α is true at I''.

As Bennett and Partee recognized in a postscript following their paper, the above definition provides holistic truth conditions for past tensed sentences containing a temporal adverbial without explaining the internal part-whole semantic contribution of the tense and the temporal adverbial. Moreover, according to (35), (36) and (37), in the logical form of a tensed sentence there is always an adverbial which can be optionally spelled out. In other words, it is stipulated that a past tense sentence such as

(38) John left

contains a hidden context dependent temporal adverbial.

This syncategorematic definition of tense finds an extreme position in Cresswell's (1973) proposal, where tense morphemes have no semantic counterparts but express only "syntactic" agreement between the temporal adverbial and the verb. As observed by Bäuerle (1979), in Cresswell's proposal it is hard to understand with what a verb should agree in a sentence containing no temporal adverbials and, more technically, it is not clear how to define the agreement between the verb and those adverbials which can occur with past, present and future morphologically marked verbs, like *today*.

The observations that we draw from our *yesterday* discussion are the following: in order to account for the interaction of tense and temporal adverbials like *yesterday*, a Priorean approach has to assume a scope order stipulation (or an equivalent index stipulation) or has to indexically anchor the meaning of tense by the occurrence of an indexical temporal adverbial.

If, on the one hand, we claimed that the scope stipulation is unnatural, on the other hand it is clear that not much of a Priorean approach remains in an indexical anchoring account. Apart from the evident differences, this proposal has rather much of a referential approach, since the semantic contribution of the Priorean tense is indexically determined or even made vacuous by a silent indexical temporal adverbial.

A scope order stipulation doesn't help much if we consider the Priorean tense in interaction with operators such as negation, as shown in the early work of Partee (1973). Partee notes that neither (40) nor (41) represents the correct LF for (39) when uttered in a car halfway down the turnpike

(39) I didn't turn off the stove

(40) ¬P(I turn off the stove)

(41) P¬(I turn off the stove)

According to the Priorean definition of tense (40) says that there is no time in the past at which the speaker turned off the stove, while (41) says that there is some time in the past at which the speaker did not turn off the stove; this is not what the sentence means. As Partee observes, the sentence refers to a contextually salient interval at which the speaker did not turn off the stove. One way to cope with this problem within a Priorean approach is to contextually restrict the temporal domain, on which the quantifiers introduced by tenses range, to a contextually salient set of times[9]. The idea is that the set of times with respect to which (39) is to be evaluated is contextually restricted to the set of times which are included in the contextually salient interval which precedes the speaker's leaving. That is to say: in the contextually salient set of times, there is a time before the speech time at which the sentence is true.[10] However, according to the original intuitions of Partee, examples like (39) not only show that the indication of the time for which a certain claim is made depends on the extra-linguistic context, but also that this dependency finds strict parallels in the pronominal domain. Imagine a man who utters (42) while sitting alone with his head in his hands

(42) She left me.

[9] This is for instance recently assumed by Kusumoto (1999) in her system by adopting von Fintel's treatment of restrictions on quantifier domains.

[10] A parallel with the referential analysis of tense is important here. As we will see, the interval denoted by tense according to a referential analysis corresponds to the contextually restricted set of times with respect to which a tensed sentence is to be evaluated.

Partee argues that the indication of the time at which *the speaker do not turn off the stove* in (39) and of the individual who *left the speaker* in (42) depend in the same way on the extra-linguistic context; by illustrating some structural analogies between tenses and pronouns in anaphoric and binding contexts, Partee observes that a naïve Priorean analysis of tense cannot be correct and that tenses behave more like pronouns.

1.1.2 Referential approaches

Partee's observation has been taken up seriously by authors like Enç (1986) who argued that tenses are referential expressions denoting times. According to these analyses, tenses are referential expressions denoting times and verbs have an extra argument slot for tenses as represented below

(43) || to love || := λyλxλt [love(t)(x)(y)]

According to this approach, tense bears an index as all other referential expressions and it fills the temporal argument slot of a verb as represented below

(44) Mary loved John
LF: love($PAST_i$)(Mary)(John)

The general idea is that sentence (44) is true iff the ordered set <||Mary||, ||John||, ||$PAST_i$||> belongs to the set of ordered sets denoted by the predicate *to love*. According to the relation denoted by *to love*, sentence (44) is true iff Mary loves John at the time denoted by $PAST_i$. Clearly the time denoted by $PAST_i$ should be a time before the speech time, according to what (44) says.

A straightforward semantics accounting for this fact has been given by Heim (1994) in her comments on Abusch (1994)'s theory of tense. Heim observes that, just like a free instance of *she* can only refer to female individuals, a free instance of $PAST_i$ must refer to a time before the time of the utterance. Heim argues that, since pronouns have been analysed as individual variables and the contribution of gender has been treated as a presupposition restricting the denotation of these variables (Cooper (1983) and Heim (1982)), we should do the same for tenses and assume them to be temporal variables carrying presuppositions. The idea is that referring pronouns and tenses are free variables carrying an index whose value is determined

by a variable assignment depending on the physical and psychological circumstances (ie the context of utterance) that prevail when a LF is processed (see Heim and Kratzer (1998)). Gender features on pronouns and temporal features on tenses are restrictions on the set of contexts of utterance which determine the assignments of the variable they are associated with (concerning the notion of presupposition see Stalnaker 1978, Lewis 1979 and Heim 1982). Consider the sentence below and its associated partial LF, where pronouns are represented as individual variables bearing indices and carrying gender presuppositions

(45) She left her

(46) x_1^{FEM} left x_2^{FEM}

Sentence (45) will be felicitously uttered in a context of utterance c if this context will determine an assignment for the indices 1 and 2 and if the individuals assigned to the indices are female. A context in which these individuals are not female is not *appropriate* for (45) (see Heim and Kratzer (1998)). The same we can do for tenses. Consider sentence (44) as repeated below

(47) Mary loved John

According to the referential approach, its LF will be something like

(48) love(John)(Mary)($PAST_i$)

Analogous to the case of individual pronouns, sentence (47) will be felicitously uttered in a context of utterance c if the time we refer by the use $PAST_i$ in c is a time which is before the time of c and the sentence is true iff $PAST_i$ denotes a time at which Mary loves John in that context. In Heim's proposal the lexical entries for the past and the present tenses are therefore formally defined in the following way

(49) $||PAST_i||^{gc,c} = g_c(i)$ when $g_c(i) < t_c$ undefined otherwise

(50) $||PRES_i||^{gc,c} = g_c(i)$ when $\neg g_c(i) < t_c$ undefined otherwise

Definition (49) says that the denotation of a temporal variable $PAST_i$ is defined if the value that the assignment function g_c assigns to the index i is a time before t_c, the time of the context

of utterance; if it is defined, it is equal to the value that the assignment function g_c assigns to the index *i*. Definition (50) says that the denotation of a temporal variable $PRES_i$ is defined if the value that the assignment function g_c assigns to the index *i* is a time <u>not</u> before t_c; if it is defined, it is equal to the value that the assignment function g_c assigns to the index *i*. The truth conditions for (47) will be therefore

(51) $\| \text{ love(John)(Mary)(PAST}_i)\|^{gc,c}$ = 1 iff *John* loves *Mary* at $g_c(i)$ when $g_c(i) < t_c$, undefined otherwise

According to the truth conditions given in (51), in the logical form of the verb there is an extra variable slot which is filled by tense and a sentence is true iff the eventuality described by the verb holds **<u>at</u>** the time denoted by the tense.

It is easy to see how we can account for the interaction of tense and temporal adverbials like *yesterday* in a referential approach. A referential definition for *yesterday* will be something like

(52) $\lambda P \lambda t \exists I(P(t) \ \& \ t \subseteq I \ \& \ I =$ the day before the day including t*)
where t* is a distinguished variable denoting the speech time

As we can see from (52), *yesterday* is a temporal modifier: it modifies a temporal property by requiring the time for which the temporal property is true be a time included in the day which is before the day including the speech time. Given the definition in (52), the LF of the sentence

(53) Yesterday Mario was sick

will be something like

(54) PAST_i (Yesterday λt(be-sick(Mario)(t)))

(55) $\exists I(\text{be-sick(Mario)(PAST}_i) \ \& \ \text{PAST}_i \subseteq I \ \& \ I =$the day before the day of t*)

Since tense is a referential expression denoting times, it is not subject to scope interaction with temporal adverbials like *yesterday* and the semantic interaction of tense and the adverbial follows straightforwardly in a compositional way. According to this analysis, a sentence like

(56) ??Yesterday Mario will be sick

is clearly predicted to be ungrammatical once we define the future morphology to be the spell out of a temporal variable whose denotation is defined for times which are not before the speech time; in this case a time which is not before the speech time is required to be included in the day before the day of the speech time.

Let us now consider the case of multiple tense embedding we discussed in the previous section. In the discussion so far, we have argued that a Priorean analysis of tense cannot account for the interpretation of the embedded tense in sentences like

(57) Hillary married a man who became the president of the US

Given that in a referential approach tenses are not sentential operators having scope on each other, the interpretation of the embedded tenses won't be problematic in these sentences, as shown by the LFs below

(58) $\text{PAST}_i\ \lambda t$[marry(-a-man-who-become(PAST_j)-the-p.-of-the US)(Hillary)(t)]

Since the embedded past tense bears a different temporal index, it can be interpreted independently from the matrix past tense. In this case, since PAST_j and PAST_i denote different past times, the sentence is correctly predicted to be ambiguous between an interpretation in which the *wedding* and the *becoming-president* are both in the past and the *wedding* is after the *becoming-president* and an interpretation in which the *wedding* and the *becoming-president* are both in the past but the *wedding* is before the *becoming-president*.

Let us now consider the interaction of tense with negation in Partee's stove example. According to the truth conditions given in (51), in the logical form of the verb there is an extra variable slot which is filled by tense and a sentence is true iff the eventuality described by the verb holds at the time denoted by the tense. According to our assumption the LF of sentence (39) will be

(59) $||\ \neg$turn-off(the-stove)(I)(PAST_i)$||^{g_c,c}$ = 1 iff it is not the case that the speaker turn-off the stove at $g_c(i)$ when $g_c(i) < t_c$, u.o.

Ogihara (1989) (see also Kusumoto 1999) observed that (59) does not represent the correct truth conditions for (39) in Partee's scenario. Imagine in fact this scenario in which the contextually relevant interval the speaker has in mind in his car while uttering (39) is a twenty-minute interval while he was getting ready. Clearly, this interval cannot be the interval **at** which he didn't turn off the stove since the *turning off the stove* event is a punctual event which takes less than a few seconds. What (39) conveys in this scenario is rather that the speaker didn't turn off the stove **in** the contextually relevant interval. Therefore, truth conditions for the interpretation of tense as given in (59) are not correct for (39); the correct truth conditions are rather something like

(60) $|| \neg$turn-off(the-stove)(I)(PAST$_i$)$||^{gc,c}$ = 1 it is false that the speaker turn-off the stove **in** $g_c(i)$ when $g_c(i) < t_c$, u.o.

That the context does not play any role in this case is clear if we consider Partee's situation again and we imagine that Mary asks me why I forgot to turn-off the stove. In this scenario, I can answer Mary's question by uttering the following sentence

(61) I was tired

Here, the contextually relevant interval the speaker has in mind is again that twenty-minute interval and the speaker is tired throughout the whole interval. The truth conditions for (61) will be therefore something like

(62) ||be tired(I)(PAST$_i$)$||^{gc,c}$ = 1 iff the speaker is tired **at** the time denoted by i, (which is the twenty-minute interval the speaker has in mind)

The generalization of the contrasts between (39) and (61) is the following: the truth conditions for a certain class of predicates like "to be tired" (*state predicates*) require these predicates to be true of the whole salient interval introduced by the tense when the tense is the simple past; the truth conditions for another class of predicates like "to turn-off the stove" (*event predicates*) require these predicates to be true of a time included in the relevant interval. [11] One way of handling this fact is to assume it to depend on the semantic properties of two different verb classes, the class of predicates like "to be tired" (*state predicates*) and

the class of verbs like "to turn-off" (*event predicates*).[12] In a later paper Partee (1984) proposes a new definition of tense which goes in this direction. She claims that the Reichenbachian *reference time*[13] plays a central role in the truth conditions of a tensed sentence and she argues that a tensed sentence is interpreted with respect to a contextually given reference time.[14] When the tense of the sentence is past, the reference time is required to be before the speech time. In order to derive the correct truth conditions for (39) and (61), Partee builds an existential quantification into the lexical meaning of the tenseless verb obtaining that when the sentence describes a state or a process, this should hold at the current reference time, when it describes an event, this must occur within the reference time. According to this proposal, the lexical entries for "to be tired" and "to turn-off" are the following

(63) ||turn-off||(x)(y)(RT)=1 iff ∃t(t⊆RT & y turn-off x **in** t)

(64) ||be tired||(y)(RT) = 1 iff ∃t(t=RT & y is tired **at** t)

As pointed out by von Stechow (1999), a potential problem for this proposal is represented by sentences like

(65) Mary was in London three times in December

According to what (65) says, the three occasions in which Mary was in London are included in a salient interval which is in December. Since according to Partee's proposal the relevant temporal relation is built in the lexical semantics of the verb, we have to find out where the inclusion relation between the *being three times in London* and the *reference time* is coming from, according to what (65) says. An explanation for this fact based on interval semantics does not help too much; let us see why. According to interval semantics (Bennett and Partee (1972)), sentences have to be evaluated with respect to intervals of time and not with respect to moments of time. The basic intuition behind this suggestion is that sentences like "John

[11] Here is enough to know that *love* and *be-asleep* are stative predicates and that they behave differently from *turn-off-the-stove*. See section 1.3.

[12] According to these conditions, the temporal interpretation of a tensed sentence depends on a discourse antecedent reference time and this brings us to the question of what should be the temporal meaning of discourse independent simple sentences.

[13] See a later section for a definition of this notion.

[14] According to these conditions, the temporal interpretation of a tensed sentence depends on a discourse antecedent reference time and this brings us to the question of what should be the temporal meaning of discourse independent simple sentences.

baked a cake" can't be true with respect to moments of time because if John baked a cake from, lets say, 1 p.m. to 2 p.m., it is not true that John baked a cake at all moments of time between 1 p.m. and 2 p.m., assuming that the predicate *bake a cake* denotes the completed event of baking a cake. According to this intuition a temporal predicate is homogeneous when, if it is true of an interval, it is true of every subinterval of this interval, if it is false of an interval, it is false of every subinterval of this interval :

(66) P is temporally homogeneous:$=_{def}$

$P(t)\rightarrow\forall t'(t'\subseteq t\rightarrow P(t'))\ \ \&\ \ \neg P(t)\rightarrow\forall t'(t'\subseteq t\rightarrow \neg P(t'))$ [15]

Clearly, the temporal predicate “Mary be three times in London” is not homogeneous since if it is true of an interval that Mary was in London three times, it is not true of all the subintervals of this interval that Mary was in London three times; this is simply because in some of the subintervals Mary is in London less then three times. Predicates like “Mary to build a house” are also not homogeneous, as we have argued in the above paragraph. Well, given that “Mary to build a house” is not homogeneous and in its truth conditions we find the inclusion relation and given that “Mary be three times in London” is not homogeneous and in its truth conditions we also find the inclusion relation, one could argue that in the truth conditions of a temporal predicate the inclusion relation is triggered by its not being homogeneous. One realizes that that this observation cannot be correct as soon as one considers punctual predicate like “to turn-off the stove”, in whose truth conditions we find the inclusion relation. These predicates are temporally homogeneous, they are precisely vacuously homogeneous since they are true of points of time which have no subparts by definition. An explanation based on the homogeneity of the predicate does not help us much in understanding where the inclusion relation in sentences like (65) is coming from.

My concluding remark to the discussion of Partee’s puzzle is the following: the class of the verb plays a crucial role in the temporal interpretation of a tensed sentence but an explanation based on interval semantics for the contrasts we have discussed in this paragraph seems unconvincing. Later on, in this chapter, I will argue that these facts are not to be analysed in purely semantic terms and I will claim that they depend on the logical syntax of aspect

[15] The definition I gave specifies that the divisibility of the predication should hold not only in the case of the *truth*, but also in the case of the *false*. Consider the predicate “John be sick”. According to our definition the predicate is homogeneous since: (i) if it is the case that “John be sick” is true of an interval, it is also the case that “John be sick” is true of every sub-interval of that interval; and (ii) if it is the case that “John be sick” is false of an interval, it is also the case that “John be sick” is false of every sub-interval of that interval.

modification and on the argument structure of different classes of predicates.[16]

1.1.3 Temporal domain restriction and referential approaches

Following the suggestion of Partee's 1984 paper, some authors such as Ogihara (1989, 1996) and Kusumoto (1999) have recently claimed that, Partee's stove example represents an argument for a quantificational analysis of tense, since the truth conditions for sentence (39) can be reformulated as

(67) There is no time in the contextually salient interval such as the speaker turns off the stove

According to these authors, tense is an operator introducing existential quantification over times in the object language. In these approaches, tense is assumed to denote a function from properties of times to properties of times as defined below

(68) PAST $=_{def}$ $\lambda P\ \exists t'[\ t' < \text{speech time} \ \&\ P(t')]$

(69) PRES $=_{def}$ $\lambda P\ \exists t'[\ t' \supseteq \text{speech time} \ \&\ P(t')]$

In order to account for Partee's stove example and obtain what is intuitively represented in (67), we need to restrict the domain of quantification to a contextually salient set of times. According to Kusumoto this can be done by following von Fintel's treatment of restriction on quantifier domains (von Fintel (1994)). The idea is that the tense operator takes an extra argument, this extra argument is a context dependent function restricting its domain.

I think that Partee's stove puzzle is not an argument for a quantificational analysis. My impression is that authors like Kusumoto came to this conclusion because they ignored aspectual distinctions in the temporal meaning conveyed by a tensed sentence and in particular they dismissed some basic differences in the temporal interpretation of stative sentences and event sentences. These authors, in fact, fail to account for the facts we have discussed in the previous section. In the next section, I will argue that if we let aspectual distinctions be conveyed by aspectual operators localising the described eventuality with respect to a time, Partee's puzzle follows straightforwardly in a referential analysis of tense.

[16] I will not propose something very different from what is assumed in Partee (1984) where it is stipulated that we have two classes of predicates behaving differently. I am only assuming aspect to be explicitly responsible for the contrast we saw above.

The general idea is that aspectual operators introduce the existential quantification that Partee builds in the lexical semantic of the verb and that the contrasts in the temporal interpretation of state sentences and event sentences depend on the logical syntax of aspect modification and on the argument structure of different classes of predicates as I have already claimed. Given these assumptions we will see that our analysis will result compositionally explicit.

1.2 ASPECT

While we find a general consensus about the basic nature of tense by recognising that it relates the time at which a claim is made to the time for which the claim is made, the notion of Aspect is much more controversial. Traditionally, aspect concerns the temporal properties of the eventuality described by the sentence. Consider the contrast between the two following Italian sentences

(70) Ieri Mario leggeva nel parco

Yesterday Mario read-3singPASTimperfective in-the park
Lit: Yesterday Mario was reading in the park

(71) Ieri Mario lesse nel parco

Yesterday Mario read-3singPASTperfective in-the park
Lit: Yesterday Mario read in the park

According to what (70) says, *Mario's reading* is going on at some time in the past yesterday and we don't know if it stopped in the past or if it is still going on at speech time; on the contrary, according to what (71) says, *Mario's reading* is completed in the past. The contrast between the temporal interpretations of (70) and (71) is an aspectual contrast and the two temporal interpretations conveyed by (70) and (71) are called *imperfective* and *perfective* interpretations. In non-formal literature, these differences are often analysed in terms of "different ways of viewing the internal temporal constituency of a situation" Comrie (1976); unfortunately such an analysis does not help us much in finding an explicit definition of aspect, since they make use of foggy notions such as *viewpoint*. Smith (1997) tries to make this notion more explicit by assuming that every situation is characterised by its initial, internal and final temporal stage and by claiming that *viewpoint aspect* is a grammatical category conveying the information that the initial and final temporal stages of the situation described by the VP are included or not included in a relevant interval. It is however hard to

give a model theoretic representation of Smith's proposal since it lacks a severe topological description of the temporal stages of a situation .

In their recent work, Giorgi and Pianesi (2001) (henceforth G&P) propose an analysis of aspectual distinctions based on event boundaries, a notion which they define by means of some topological axioms and which is therefore more explicit than the one of temporal stage of a situation. According to G&P, the aspectual distinctions conveyed by (70) and (71) are to be analysed in terms of properties of the events described by the sentences.[17] In the event domain, there are two kinds of events: topologically closed/terminated events and topologically non-closed/non-terminated events. Terminated events can be defined by means of a function *ter*, which assigns to an event its terminated counterpart

(72) $ter(e)$ = the terminated counterpart of e;
when e is terminated, $ter(e)=e$;
when e is non-terminated $ter(e)\neq e$.

Moreover, a terminated event is defined by the following topological axioms

(73) $ter(e) = b(ter(e)) + int(ter(e))$,

where $int(ter(e))$= the interior of $ter(e)$, i.e. the maximal part of e that is completely unbound, and $b(ter(e))$= the boundary of $ter(e)$, i.e. the parts of ter(e) which separate it from the rest of the eventive world. Given these assumptions, the difference in the aspectual meanings of (70) and (71) depends on the presence or on the absence of a terminative condition in their LF, as represented below according to event semantics

(74) LF for (70): $\exists e(\alpha(e)$ & ...)

(75) LF for (71): $\exists e(\alpha(e)$ & ... $t(e)$ & ...)
where t denotes the property of being a terminated event.[18]

According to G&P, in Italian "perfective" sentences like (71), a morphological *perf* features hosted in an aspectual functional projection checks the presence of the $t(e)$ condition in the

[17] As we will see in the next paragraph, we can assume events to be primitive entities in the discourse domain and event sentences to describe event properties (Davidson (1967)).
[18] Notice that (74) is compatible with both terminated and non terminated events; this means that according to G&P both terminated and non terminated events can be described by imperfective morphological marked predicates.

VP. Since we do not find morphological oppositions in English, G&P assume that the *perf* feature, which checks for terminativity, is not hosted in an aspectual functional projection in this language, but it is added to the bare verbal form after it is extracted from the lexicon and before it is inserted in the derivation. As we can see from (74), in the LF of morphological imperfective sentences, the predicate *t* requiring the described event to be terminated is missing. This entails that morphological imperfective sentences can be use to describe both non-terminated events and terminated events. I will dispute this fact, especially in the light of the data presented in chapter 4.

Interestingly, G&P develop their theory of terminativity in order to characterise the notion of telicity from a morpho-syntactic perspective. The idea is that the presence or absence in the LF of an extra event variable for the right boundary of a terminated event distinguishes telic sentences from atelic ones:

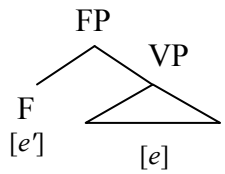
- be *t* an event predicate S.T. $t(e) = 1$ iff *e* is a closed/terminated event
- be *rb* a right boundary relation S.T. $rb(e,e') = 1$ iff *e* is the right boundary of e'

(76) LF for terminated atelic sentences $\Rightarrow \exists e(\alpha(e) \,\&\, ... \,\&\, t(e))$

(77) LF for terminated telic sentences $\Rightarrow \exists e \exists e'(\alpha(e) \,\&\, ... \,\&\, rb(e,e'))$

According to G&P, the presence of the second event variable for the right boundary is realised by a zero morpheme in languages such as English and Italian:

(78)



As represented in (78), the head F provides an eventive variable, which is interpreted as the boundary variable. Following Higginbotham's (2000), G&P argue that the difference between (76) and (77) accounts for the distribution of *in x time* adverbial and *for x time* adverbials. According to G&P, while i*n*-adverbials measure the time span between two events, *for*-adverbials measure the event 'quantity' of one event. Given the analysis of telic sentences we have seen above, the distribution of *for*- and *in*- adverbials follows in the following way. Consider the following English sentences and their associated LFs

(79) a. John ate an apple in two minutes

b. $\exists<e_1,e_2>\exists x(eat(<e_1,e_2>) \& \theta_1(<e_1,e_2>,John) \& \theta_2(<e_1,e_2>,x) \& apple(x) \& \mathbf{\delta_{INm}(e_1,e_2) = 2})$

(80) a. John ran for two minutes

b. $\exists e\exists x(run(e) \& \theta_1(e,John) \& t(e) \& \mathbf{\delta_{FORm}(e) = 2})$

As we can see from (79) *in-* adverbials appear in telic sentences; given that they denote a function that measures the eventive span between them[19] they occur in sentences where we have two event variables. The LF of atelic predicates contains only one event variable; for this reason "in x time" adverbials do not combine with them. On the other hand, since f*or-* adverbials measure the event 'quantity' of one event they occur in atelic sentences but not in telic ones.

There are a number of problems with G&P's proposal. The first concerns the fact that G&P assume that durative temporal adverbials such as 'in x time" and "for x time" measure the quantity of eventive stuff onto a temporal scale, namely they assume that durative adverbials measure the length of events. A potential problem for this analysis is represented by the sentence below

(81) John reached the top in two hours

According to what the sentence says, the *reaching of the top* is obviously not two hours long. The adverbial in (81) conveys rather the information that the event took place within a two hour long interval. This means that the adverbial should measure the reference time, the time in which the event is included, and not the length of the event: not a new observation, that goes back to Dowty's (1979) definitions of *in x time* and *for x time* adverbials. This point is clearer if one considers the sentences below

(82) A Champaign man was arrested twice in two days for two separate crimes.

(83) Microsoft's network crashed three times in two weeks.

[19] It is not so clear how we can formalize this idea since the *in-* adverbial should take as argument a relation between two events and it should give the relation back by saying that the distance onto a temporal scale

In (82) and (83) the *in*-adverbials do not measure the distance between an associated activity and a telos of a telic event but the length of the time in which the described events took place.[20] This shows that *in*-adverbials cannot measure the length of events. [21] Moreover, in G&P's proposal, it is not clear which is the semantic difference between *x time* and *for x time* adverbials since the adverbials of both classes measure the length of terminated events, which all have a right bound. In the next chapter of this dissertation I will argue that durative adverbials such that *in x time* and *for x time* measure the length of times as proposed in Dowty (1979).

A second problem strictly related to the first one concerns the LF of achievement predicates such as "to reach the top". If we consider (81) again, one could say that, actually, the *in x time* adverb measures the distance between an event which is the preparation phase of *reaching the top* and an event which is the reaching of the top itself. This second event is a punctual change of state which is clearly the right boundary of the preparation activity. One problem with this analysis is the definition of the correct LF for telic sentences containing punctual predicates such as *to reach the top*. This LF cannot be something like (80), since in this case we won't be able to explain why *in x time* adverbials but not *for x time* adverbials combine with such predicates; on the other hand, if we say that it is something like (79), which is obtained via merging a functional projection providing the right bound event variable to the LF of the telic sentence, we do not understand which should be the lexical entry of achievements predicates like "to reach the top". Since (81) describes a telic event, the functional projection F should lexicalise the right bound of the described terminated event. According to this analysis, the predicate "to reach the top" should therefore lexicalise the preparation phase of the change of state event that is the reaching of the top. I think that this is

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between the right bound event and the left bound of the associated activity is equal to a certain value indicated by the adverbial.

[20] If we try to make sense of these sentences in G&P's proposal we have to deal with an under-determinacy of the events domain. This because the definition of right bound requires us to take what separate a terminated event from the rest of the eventive world and we do not understand what the "rest of the eventive world" means.

[21] English *in*-adverbials are actually ambiguous between two readings: (i) the durative reading which we are discussing now; (ii) and a second reading, meaning *after the time of the context* (see Schlenker, P. (2001). A Plea for Monsters. Los Angeles, USC.). This reading doesn't measure the length of an event either but the length of the time span between the origo and the beginning of the event. The G&P's account doesn't capture this reading either. Here is an example:

(a) I will call you in ten minutes

The sentence doesn't say that the *calling* event is ten minutes long. It rather says that the *calling* event will take place ten minutes after the speech time: the adverb here doesn't measure the eventive stuff at all. The ambiguity of „in x time" is morphologically realised in a language such as Italian where the two meanings are conveyed by two different adverbials, as shown by the sentences below

(b) Gianni raggiunse la vetta **in** due ore
Gianni reached the top in two hours

(c) Ti telefonerò **tra** dieci minuti
You I-will-call in ten minutes

absurd. On the other hand, if we assume these predicates to be inherently telic, i.e. them to lexicalise a telos which is the right boundary of a contextually given possible associated activity, we drastically contradict the basic claim that the telic/atelic distinction is a morphosyntactic distinction concerning the way in which language represents terminated events; and even if we do not care to much about the general claim, we have to explain where the second event variable which lexicalizes the associated activity is coming from, given the presence of the *in x time* adverbials.[22]

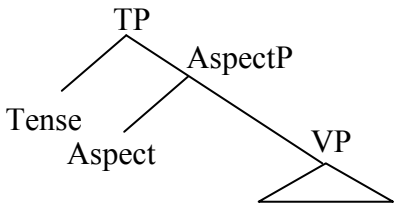
A third problem for G&P's proposal is that the analysis predicts Imperfective sentences to convey terminative readings in free variation with perfective ones. In chapter 4 of this dissertation I will argue that this prediction is empirically incorrect.

Finally, besides the fact that G&P fail to account for states sentences and fail therefore to account for the interesting semantic contrasts we discussed with Partee's stove puzzle, there are some questions concerning how their proposal can be formally represented in model theoretic semantics given the genericity of some of its aspects. For instance it is not clear how *t* compositionally gets in; the proposal suggests to us that a functional projection introducing *t* modifies an event VP but the formal details of how this takes place are hard to imagine; it is not clear in which way F lexicalises the second event variable in telic sentences and how the adverbial modification is obtained. My opinion is that all these facts show that it is hard to analyse aspectual distinctions in terms of event boundaries or event stages without talking of times.

In the analysis we have discussed so far aspect is not considered in interaction with tense. My point of view is that in order to define the correct and explicit contribution of these two grammatical categories in the temporal interpretation of a tensed sentence, we have to look at the general temporal architecture of language. According to recent work going into this direction by Klein (1994), Kratzer (1998), Musan (2000) and Stechow (2002), I will assume that aspect concerns the temporal relation holding between the time at which the eventuality described by the VP is going on and the time introduced by tense, namely between the Reichenbachian reference time and the event time (see Klein (1994)). The formal idea (Kratzer (1998)) is that aspectual distinction are conveyed by means of aspectual operators which map properties of eventualities denoted by the VP into properties of times and that tense provides the time which saturates the obtained temporal property

[22] It cannot be lexicalized by F, since F lexicalizes the right bound of a terminated event.

(84)



Kratzer (1998) assumes that the two most common aspectual operators are the *imperfective* and the *perfective* operators as defined below[23]

(85) Perfective =: ||PFV|| = λPλt∃ev(t ⊇ τ(ev) & P(ev))
[event time included in reference time]

(86) Imperfective =: ||IPV|| = λPλt∃ev(τ(ev) ⊇ t & P(ev))
[reference time included in event time]

where τ is a function taking an eventuality and giving its temporal trace

and that the two most common tenses are the past and the present tense.

Kratzer's suggestion is that verb forms are the spell-out of tense/aspect combinations, as shown in the tables representing the English tenses below

(87)

English	PRESENT	PAST
Imperfective	Present progressive	Past progressive
Perfective	Reporter's present	Simple past

Italian	PAST
Imperfective	Imperfetto
Perfective	Passato Remoto

According to this proposal, if we assume Heim's semantics of tense given in (49) and (50),

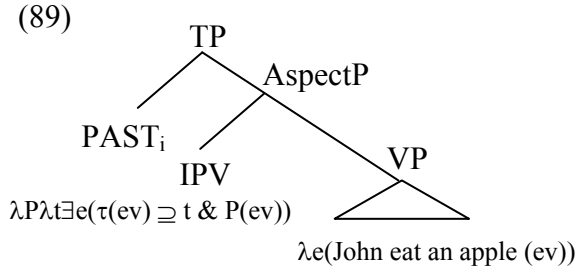
[23] I give a slightly modified definition from Kratzer's and I disregard the *Perfect* aspect which plays a fundamental role in Kratzer's paper but which is not relevant to our discussion. Moreover the IPV operator as defined above does not give us the correct truth conditions for the English progressive, as observed in Dowty (1979). We will assume it for the sake of the discussion and we will give a "new" definition in chapter 3.

the LF of the English sentence

(88) John was eating an apple

will be

(89)



According to (89), sentence (88) will be defined if $g_c(i)$<speech time and it will be true iff $g_c(i)$ is a past time included in the temporal trace of *John eat an apple* event.[24]

One question concerning the classification in (87), concerns state predicates. As is well known, state predicates do not appear in the progressive form

(90) *Peter is being asleep

Moreover, state predicates do not get a perfective interpretation under the past morphology, as observed by Smith (1997) and Klein (1994)

(91) Peter was sick (and he is sick)

while event predicates do

(92) Peter drank a beer (??and he is still drinking one)

And as noted by Katz (2000), these facts are not dependent on event telicity or event divisibility/cumulativeness (Krifka (1989)) since activity predicates, which are atelic and cumulative in the sense of Krifka, are good in the progressive and behave like the telic predicate *Peter drink a beer*

(93) Peter was walking around aimlessly

(94) Peter walked around aimlessly (?? and he still is)

The question at this point is what is responsible for these aspectual distinctions between state and event predicates. In the following section we will see that basic differences concerned with their argument structure of these two verb classes are responsible for the aspectual contrasts described above.

1.3 Verb classes

In the semantic literature, the term aspectual verb classes is used to refer to the Ryle-Kenny-Vendler verb classification which developed from the Aristotelian distinction between verbs of *kineseis* (movement) and verbs of *energiai* (actuality) (see Dowty (1979) for an overview of the history of this classification). Starting form the work of Vendler (1957), this verb classification has given particular attention to the temporal structure associated with the verb meaning and it has been further investigated in a formal framework in Dowty's (1979) work on lexical decomposition. According to Vendler's analysis, verbs are to be classified in *states*, *activities*, *accomplishments* and *achievements*. According to this classification, a verb falls in one of these four categories on the basis of its response to some tests, mostly concerned with temporal adverbials combination and tense morphology. Examples of Vendler's classes are given in the table below (Dowty (1979))

States	*Activities*	*Accomplishments*	*Achievements*
know	run	paint a picture	Recognize
believe	walk	make a chair	Spot
have	swim	Deliver a sermon	Find
desire	push a chart	draw a circle	Lose
love	drive a car	push a cart	Reach

According to interval semantics, (Bennett and Partee (1972)), this classification can be explained if we assume that sentences are evaluated with respect to intervals of time[25] as we argued in section 1.1.2.

[24] Here again, the IPV operator does not give us the correct truth conditions for the English progressive sentence; its correct definition will be given in chapter 3.

Given that sentences are evaluated with respect to intervals, Bennett and Partee argue that we have to consider the truth values of a sentence at every subinterval of the interval at which the sentence is true in order to account for the Vendlerian distinction: [26]

(95) a. If ϕ is a *state* or an *activity* sentence, then ϕ is true at an interval I just in case ϕ is true at all subintervals of I.

b. If ϕ is an *accomplishment* sentence which is true at an interval I, then ϕ is false at all proper subintervals of I.

c. If ϕ is an *achievement* sentence then if ϕ is true at I, there is no proper subintervals of I.

One important cut between these four Vendlerian classes is the one between *stative* and *non-stative,* first made by Lakoff (1970). Unfortunately, this distinction does not follow straightforwardly from the subinterval relationship as we can see from (95). Dowty (1979) and Vlach (1993) argued that in the case of the activity sentences the condition *a* in (95) should be modified, since the smallest interval at which an activity sentence holds can't be a momentary interval; this, on the other hand, can be for state sentences. In fact, an activity sentence like "Mary walked in the park" cannot be true iff there is a momentary past interval at which Mary walks, simply because a walk takes at least two steps; on the contrary, a state sentence like “Mary was sick” can be true iff there is a momentary interval at which Mary is sick, since if one is sick at some time he is sick at every momentary interval of this time. In other words, while state sentences are fully homogeneous, activities are homogeneous *down to a certain limit*.[27] The notion of *down to a certain limit* can help us in distinguishing states from activities through the following reformulation of condition *a* in (95)

(96) a. If ϕ is an *activity* sentence, then ϕ is true at an interval I just in case ϕ is true at all subintervals of I down to a certain natural limit.

b. If ϕ is a *state* sentence, then ϕ is true at an interval I just in case ϕ is true at all subintervals of I.

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[25] Intuitively, an interval I is to be considered as an ordered set of moments of time such that for any $t_1,t_3 \in I$, if t_2 is such $t_1 \leq t_2 \leq t_3$, then $t_2 \in I$ (see Bennet & Partee (1978): 11).

[26] Let us accept here the notion of "true at an interval" which, as we have seen in the previous paragraph, can be interpreted in many ways.

[27] I find the notion of *down to a certain natural limit* a little hazy. Vlach (1993) defines it as the *grain size* of a predicate. The *grain size* of a predicate is the smallest interval for which the predicate can be said to hold.

Given this distinction, Taylor (1977) argued that state predicates do not appear in the progressive form since the progressive form is the spell-out of a sentential operator which takes a proposition that is true at an interval and returns a proposition that is true at all subintervals of that interval.[28] According to Taylor, the occurrence of a state predicate in the progressive form would violate Gricean principles since, being states homogeneous, the progressive form of a state predicate will be equivalent to its basic form.

As Katz (1995) points out, this analysis is not entirely convincing for two reasons. First, Gricean principles should be able to violated for pragmatic purposes but we never find progressive forms of state predicates used to obtain pragmatic effects. Secondly, there are some activity predicates, such as *to sleep*, which intuitively do not show any natural limit to their homogeneity but do appear in the progressive form as shown below

(97) John is sleeping

This suggests that an account of the state/non-state distinction in terms of interval semantics is problematic. Moreover, I think that a pure semantic account of the fact that state sentences do not appear in the progressive cannot be correct if we consider that the sentence

(98) John is asleep

means exactly the same as (97) , and that the sentence

(99) *John is being asleep

is not acceptable, thus the same state of affair makes (97) and (98) true. According to some authors (Galton (1984), Löbner (1988), Herweg (1991) and Katz (1995, 2000)), this contrast is actually the sign of a deeper cut between state and non-state predicates: state and non-state predicates denote properties of entities from different ontological domains. In the next section, following some of the arguments of these authors, I will argue that the verb classes distinction, which is relevant for the explanation of the contrasts discussed above, is the one between state predicates and event predicates.

[28] PROGϕ is true at an interval I just in case there is an interval I^i that properly includes I and ϕ is true at I^i (Taylor, 1977).

1.3.1 State predicates and event predicates

In his 1967 article, Davidson proposes that *action* sentences like (100) should be analysed as sentences expressing an existential quantification over events

(100) John buttered the toast

The idea is that sentence (100) says that there is a past event of *John's buttering the toast.* Davidson's motivations for assuming events in the basic ontology of natural language mainly concern an analysis of adverbs which is sensible to logical entailment.[29] As Davidson observes, every sentence in (101) is entailed by its predecessors

(101) a. Jones buttered the toast

b. Jones buttered the toast with a knife.

c. Jones buttered the toast with a knife in the bathroom.

Davidson argues that if we assume that the logical form of an action sentence contains an event variable which stands for the event described by the sentence, the entailment relations from a. to c. follow straightforwardly from the law of predicative logic, since these sentences express relations between individuals and events. According to Davidson's analysis, the sentences in (101) will have a LF in which an event variable fills an extra argument slot of the verb and of the adverbs

(102) a. $\exists e$[butter(Jones, the toast, e)]

b. $\exists e$[butter(Jones, the toast, e) & With(a knife, e)]

c. $\exists e$[butter(Jones, the toast, e) & With(a knife, e) & In(the bathroom, e)]

The entailment relations follow, therefore, from the rule of conjunction elimination. In his original proposal Davidson, points out that not all verbs have an underlying Davidsonian argument. While *action* sentences do have one, *fact* sentences do not. According to Davidson fact sentences are sentences describing states which LF will be something like

[29] See Thomason and Stalnaker (1973) for an alternative analysis and Parsons (1980, 1990) for a discussion about different approaches.

(103) John loves Mary

LF: love(John, Mary)

In contrast to its original formulation, Davidson's proposal has been extended to state verbs as well as event verbs by assuming that the logical form of a state sentence contains a state variable which stays for the state described by the sentence, as represented below

(104) John loves Mary

LF: ∃s [love(s)(John)(Mary)]

The development of this approach, which in the literature is called *neo-Davidsonian*, also assumes thematic roles predicates in the LF of a state sentence (Higginbotham (1985) and Parson (1990)).[30] Interestingly, this extension provides the basis for an analysis of Vendler's verb classification

- Activity verbs are predicates of homogeneous events.
- Accomplishment verbs are predicates of non-homogeneous events.
- Achievement verbs are predicates of momentary events.
- State verbs are predicates of underlying states.

The original Davidsonian proposal has however been defended and assumed by some other authors (Galton (1984), Löbner (1988), Herweg (1991) and Katz (1995, 2000)) who believe the stative/non-stative distinction to be based on the fact that while event verbs have an underlying event argument, state verbs do not. In this dissertation I will follow this approach and I will assume that while state predicates denote properties of times, event predicates denote properties of events, as suggested by Herweg and more recently by Katz. In the basic ontology of natural language I will therefore include events and times.

Though there is no decisive argument in favour of one position or another, Katz (2000) has recently given some convincing arguments in favour of this latter approach. Katz claims that on the neo-Davidsonian account we should find some semantic parallels between state

[30] With the term *neo-Davidsonian* we usually refer to the semantic implementation of Davidson intuition. In its development, thematic role predicates are also introduced into the logical form of a sentence. In most of these proposals Davidson's intuition is extended to the analysis of state sentences as well. Following Katz (2000) I will refer here to those accounts that assume that all sentences have underlying davidsonian arguments, in contrast to Davidson's original proposal.

sentences and event sentences given their parallel logical structure and if these parallels are not found, there is an evidence against the neo-Davidsonian account. Katz shows that these parallels are not found in a number of important domains such as anaphora, nominalization, perception verbs, but the most convincing argument concerns adverb modification. As known, there are classes of adverbs, such as manner and instrumental adverbials, which appear with event verbs but not with state verbs

(105) a. Bill buttered the toast carefully.

b. ?? Bill owned the knife carefully.

There are also classes of adverbs, such as modal adverbials, that appear with both event verbs and state verbs

(106) a. Bill probably buttered the toast.

b. Bill probably owned the knife.

But interestingly, we do not find adverbials which appear with state verbs but not with event verbs. That is to say, it does not seem to be the case that there is a class of state adverbials. As Katz observes, on the neo-Davidsonian approach state adverbs might be expected. These adverbs, might denote properties of states, like state verbs do. According to the approach in which state verbs denote properties of times, such stative adverbs are, on the other hand, ruled out. This is because, if an adverb appears with a state verb it should be a temporal modifier or a propositional operator, and therefore it should also be able to appear with event verbs once the event variable is existentially closed. Given these basic differences between state and event predicates in section 1.5 we will formally analyse some interesting English facts we are presenting in the next section.

1.4 Summing up some English facts we want to account for

As we have been discussing in the previous section, state predicates do not appear in the progressive form while event predicates do in English (Kenny 1963, Lakoff 1965)

(107) ??Peter is being asleep now

(108) Peter is running in the park now

Interestingly, event predicates are bad in the present tense, when not interpreted habitually[31], while state predicates are fine

(109) Peter is asleep now

(110) ??Peter runs in the park now

Moreover, state predicates do not necessarily get a perfective interpretation under the simple past while event predicates do (Smith (1997), Klein (1994))

(111) Peter was sick (and he still is)

(112) Peter drank a beer (??and he still is)

According to what (111) says, the state of *Peter being sick* is not required to be terminated in the past with respect to the speech time, as shown by the availability of the continuation in parenthesis; on the other hand, according to what (112) says, the event of *Peter drinking a beer* is required to be entirely terminated before the speech time, as shown by the non availability of the continuation in parenthesis. As observed by Katz, it is clear that the contrast between (111) and (112) does not depend on the telicity of the predicate "to drink a beer" once we consider an activity sentence like the one below

(113) Peter walked around aimlessly (?? and he still is)

Here again, the described event of *Peter walking around aimlessly* is required to be entirely terminated before the speech time; for the sake of the argument, the predicate in (113) is clearly not a state predicate, since it combines with the progressive, as shown by the sentence below

(114) Peter was walking around aimlessly

In the next section, I will argue that the distributional facts in (107)-(110) are strictly associated with the semantic facts in (111)-(113).

[31] I will account fort his fact in chapter 3.

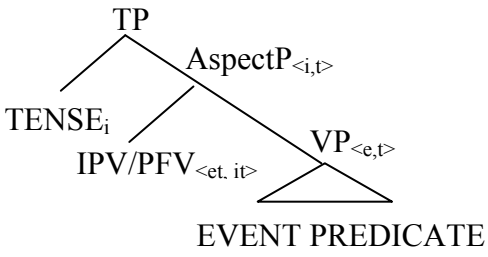
1.5 My proposal

In order to account for the above facts, I will claim that aspectual operators are responsible for the existential closure of the event variable of event predicates. Particularly, I will propose that aspectual operators denote functions from properties of events into properties of times and, therefore, that state sentences are aspect free sentences. Given this assumption, the temporal architecture I am proposing is characterized by the following points:

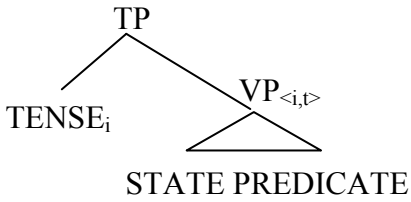
- Tenses are referential expressions, i.e. temporal variables carrying presuppositions.
- State predicates denote properties of times; the LF of state predicates has an extra argument slot for a temporal variable.
- Event predicates denote properties of events; the LF of event predicates has an extra argument slot for an event variable.
- Aspectual operators are functions taking event properties and giving time properties and they locate the described event with respect to a time; the two most common aspectual operators are PFV and IPV.
- The progressive is the spell out of the IPV aspectual operator.
- The PVF operator is a silent operator.
- Temporal adverbials are temporal modifiers, i.e. they denote functions from properties of times to properties of times.
- Event adverbials, such as manner adverbials, are event property modifiers, i.e. to denote functions from properties of events to properties of events.

The temporal architecture of event and state sentences will be therefore

(115) **EVENT SENTENCES**



(116) **STATE SENTENCES**



Given these assumptions, the contrasts in the temporal interpretation of event sentences and state sentences follow straightforwardly. Consider the state predicate "to be sick" and the event predicate "to butter the toast" and see the predictions that our proposal makes. The argument structure of the state predicate *be sick* and of the event predicate *butter the toast* will be something like

(117) $\lambda x \lambda t$(be-sick (x)(t))

(118) $\lambda x \lambda e$(butter-the-toast (e) & agent(e, x))

Once the two predicates combine with the subject-VP, we obtain the following two properties

(119) λt(be-sick(John)(t))

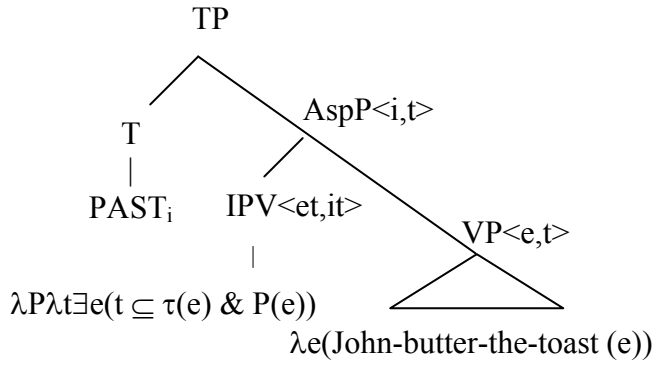
(120) λe(butter-the-toast (e) & agent(e, John))

Given the difference in the argument structure of the two predicates and the assumptions we have made so far, we can explain why state predicates do not appear in the progressive form while event predicates do, as shown in (107) and (108); being the progressive form the spell out of the IPV operator of logical type <et, it> it cannot combine with a state predicate like "to be sick", but it does combine with an event predicate like "to butter the toast", given their logical types. Its application to the event predicate will give the following temporal property

(121) $\lambda t \exists e(t \subseteq \tau(e)$ & John-buttered-the-toast(e))

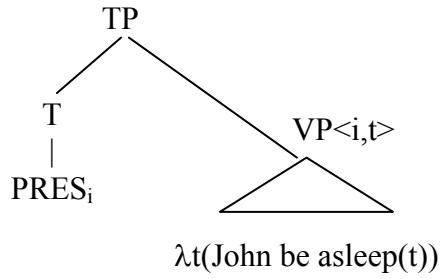
This is the property of being a time included in the temporal trace of the *John buttering the toast* event. According to our temporal architecture, this temporal property is in turn saturated by the denotation of the temporal variable introduced by the tense, as represented below

(122)



We can additionally explain why state predicates appear in the present tense while event predicates generally do not, as shown in (109) and (110). State predicates, can directly combine with the tense and the LF for (109) will be something like

(123)



Event predicates can combine with tense via aspectual modification; in (110) there is clearly no occurrence of the IPV operator since this operator is spelled-out by the progressive form; the PFV operator could in principle occur in (110) since it is morphologically silent. In this case the sentence receives a special reading which is described as the *reports'* reading in the literature (see Kratzer (1998)). In our special case this reading is difficult to derive given the presence on the *now* adverbial which requires the interval including the temporal trace of the *buttering* event to be equal to the speech time conceived as a point. It should be said that event predicate can appear in the present tense under a habitual reading as well. We will account for this fact in chapter 2 and chapter 3.

In our system, we can moreover account for the important fact that the truth conditions of a sentence like "I didn't turn-off the stove" requires the *turn-off the stove* event to be included in the salient past interval introduced by the tense while the truth conditions of a state

sentence like “I was tired” requires the described state of the *speaker’s being tired* to hold at the whole salient past interval introduced by the tense. According to our analysis, in the specific case of Partee’s stove puzzle, the contextually relevant 20 minutes interval is the interval denoted by the tense. Since state predicates denote time properties and they can combine directly with tense, the state predicate *be tired* will be true of the whole 20 minute interval; on the contrary, since event predicates combine with aspect before merging with tense, the PFV operator will require the temporal trace of the *I turn-off the stove* event to be included in that 20 minutes interval (ignoring the role of negation). For the same reason, state sentences in the simple past do not describe events which are entirely terminated in the past, as shown in (111): the lack of the perfective operator in the LF of a simple past tense state sentence allows the state described by the sentence to hold at speech time. Event telic predicates like “to drink a beer” have a terminative reading under the simple past, since the PFV operator requires the time which is the temporal trace of a telic event to be included in the interval introduced by the tense. That PFV cannot take the temporal trace of a sub-event of a telic event *P* yielding therefore a non terminative reading is intuitively clear: the sub-event of a telic *P*-event it is not a telic *P*-event itself (see the arguments for interval semantics we discussed in section 1.1.2). The system predicts however that simple past sentences containing event activity predicates like “to walk around aimlessly” (or better “to sleep”) can have a non terminative reading. This is because these predicates are homogeneous (down to a certain limit in some cases like “to run in the park”, since it takes at least two steps to perform a running). Since, an event predicate *P* is homogeneous if *P* is true of an event *e,* it is true of every sub-event of this event, from the definition of the PFV operator it follows that the interval denoted by the temporal variable introduced by the tense can include the temporal trace of a *P*-event which is a sub-event of a bigger event of the same type. In our case, the past interval introduced by the tense can include the temporal trace of a *Peter walking around aimlessly* which is a sub-event of a *Peter walking around aimlessly* bigger event. Thus, the fact that (94) gets a terminative interpretation under the simple past verbal morphology is not explained. Such a prediction is made in G&P’s system as well since a terminated telic event can be a sub-event of a bigger non terminated event of the same type. This also happens in another neo-Davidsonian system like Parson’s (1980, 1989, 1990). Let us see it. In order to account for the fact that event predicates describe terminated event under the simple past, Parsons introduces event predicate called *Cul* which is true of an event and a time if that event culminates at that time

(124) *Cul* (*e*, t) = 1 iff the event *e* culminates at time t

Given this event predicate, Parsons introduces a semantic principle for the interpretation of simple past event sentences

(125) If A is an event verb occurring in a simple non progressive sentence, the logical form of the sentence contains *Cul.*

The logical form of a sentence like

(126) John slept on the grass

Will be therefore something like

(127) $\exists t \exists e$(sleep-on-the-grass(e) & Theme(e, John) & *Cul*(e, t) & t<now)

Clearly, given that the event predicate *sleep-on-the-grass* is homogeneous, the above truth conditions for (126) won't rule out its possible continuation below

(128) … and he is still sleeping

One way to cope with this problem in both a Kratzerian and a neo-Davidsonian system is to stipulate that event predicates are maximalized when denoted by simple past sentences. One way in which we can integrate this assumption in the system I am proposing is to say that the PFV operator is responsible for the maximalization of the event predicate in the following way

(129) PFV = $\lambda P \lambda t \exists e(t \supseteq \tau(e)$ & P(e) & $\neg \exists e'(e \subseteq e'$ & P(e'))

In chapter 2 we will discuss a potential problem of such an assumption and we will see an alternative solution..[32]

[32] There are cases in which the sentence is not perfectively interpreted. This happens when the predicate is a fine grain predicate such as the ones in the sentences below

(i) He was shot while he slept

Finally, our system can explain some adverbial modification facts. In first place, it explains why manner adverbials appear in event sentences but not in state sentences, and why temporal adverbials appear in both sentence types. Let us consider the definition of temporal adverbials like *yesterday* again

(130) Yesterday: λPλt∃I(P(t) & t⊆ I & I = the day before the day including t*)
where t* denotes the speech time

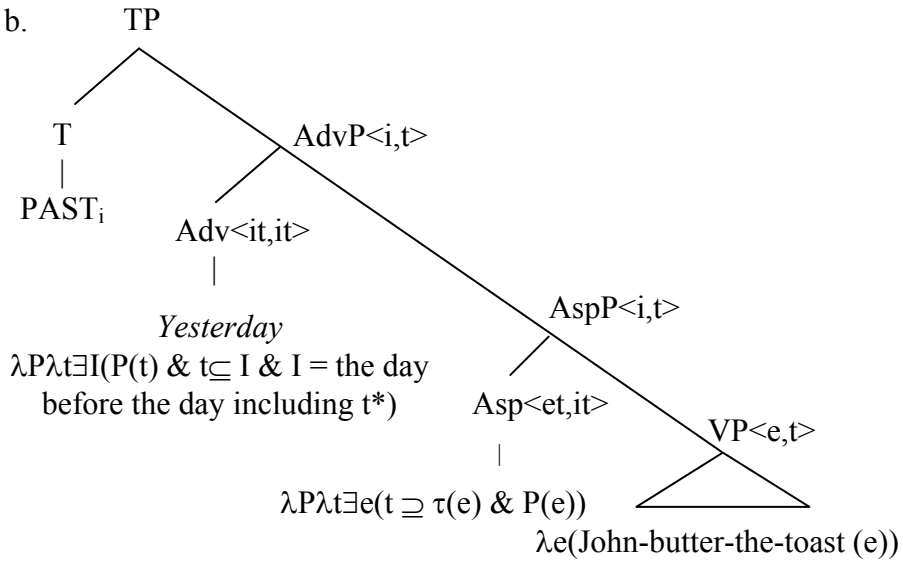
According to our definition *yesterday* is a temporal modifier; it modifies a temporal property by saying that it is a property of a time which is in yesterday. On the contrary, manner adverbials like *carefully* are assumed to be VP level adverbials modifying an event predicate (or a relation between an event and an individual), as roughly given in the following definition

(131) Carefully: λRλxλe (R(x,e) & carefully(x, e))

We have already seen in which way *yesterday* modifies state sentences like "John was sick yesterday". In the case of event sentences like "John buttered the toast yesterday" *yesterday* will merge after the application of the aspectual operator as shown below

(132) a. John buttered the toast yesterday

b.



(ii) He was killed while he rode his motorbike

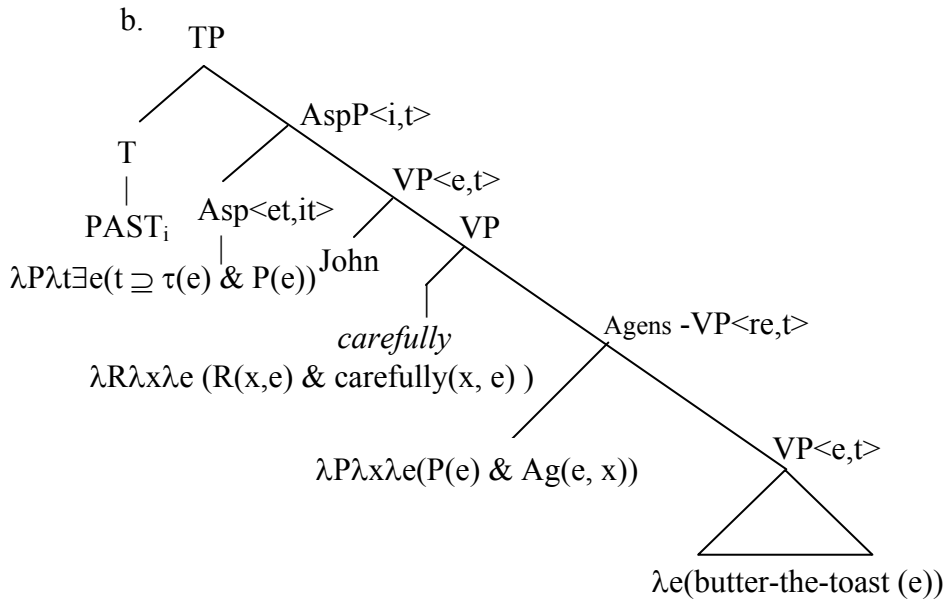
I found a lot of similar sentences in the BNC corpus.

This explains why an adverb like *yesterday* can appear in both event and state sentences. On the other hand, a manner adverb cannot appear in a state sentence since there is no event property (or eventive relation) to be modified; it can however modify an event predicate, as shown below (where the semantics of the manner adverbial is roughly sketched)

(133) ?? John was sick carefully

(134) a. John buttered the toast carefully

b.



Clearly, this analysis will predict the linear order for the co-occurrence of adverbs like *yesterday* and *carefully* represented in the sentences below

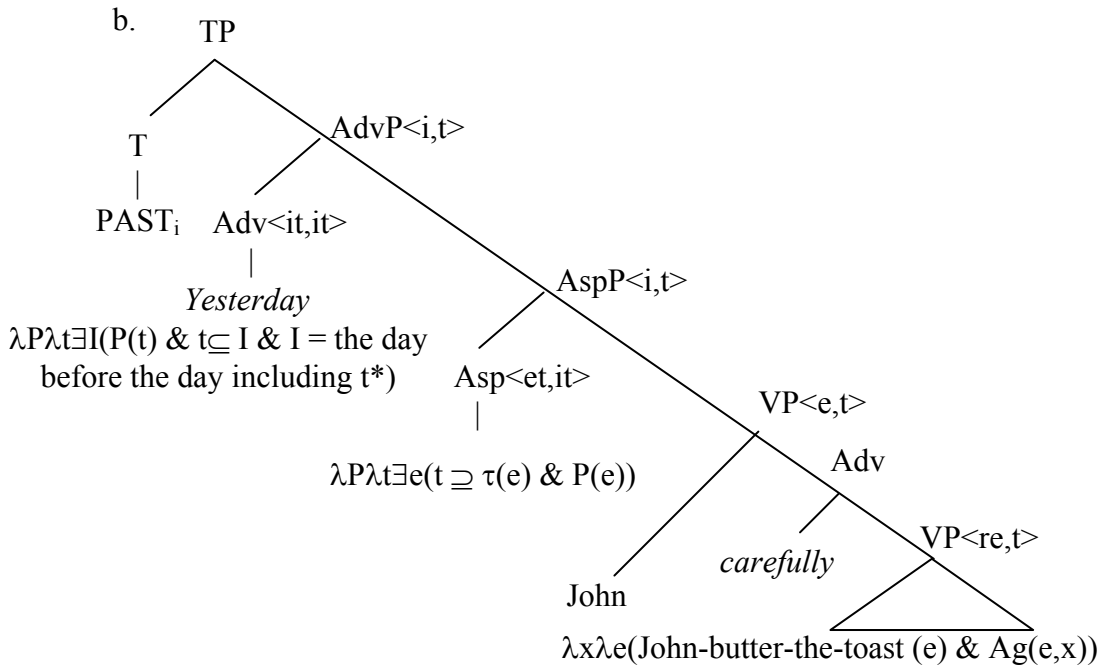
(135) Yesterday, John buttered the toast carefully

(136) John buttered the toast carefully yesterday

(137) *John buttered the toast yesterday carefully

The Since temporal adverbials like *yesterday* are temporal modifiers occurring above the aspectual projection, it is predicated that they do not show up in a position between the lexical verb and the manner adverbial, given the LF below

(138) a. Yesterday John buttered the toast carefully



1.6 Comments and conclusions.

In this chapter I argued that in order to derive the temporal meaning of a sentence we have to analyze the main components of the temporal interpretative mechanism in interaction with each other. We saw that when this is not done we have to make some implicit stipulations in order to derive the correct truth conditions of a tensed sentence. I illustrate that a referential analysis of tense avoids some of the well known problems a quantificational one encounters; I shown the difficulties of G&P's analysis of aspectual distinctions based on event properties and I argued for an analysis of aspectual distinction *a la* Kratzer, where aspectual operators located below tense are responsible for aspectual contrasts. I proposed that aspectual operators play a crucial role in the derivation of the different temporal interpretations conveyed by event sentences and state sentences. Concerning this point, we have observed that while we account for the fact that state predicates do not appear in the progressive and event predicates not in the present tense, we predict that homogeneous event predicates like "to sleep" can have a non terminative reading in the simple past unless we stipulate that the described event is maximalized by the PFV operator.

Since in our system state sentences are aspect free sentences and can have a non terminative reading in the simple past, cross-linguistic comparison with languages in which we find morphological aspectual contrasts is important. For instance, in languages such as

Italian a state predicate get a terminative reading when appearing in a past perfective morphological tense, as in the sentences below

(139) Maria fu malata (??e lo è ancora)
Maria be-Past.Perf sick (and she still is)

(140) Maria è stata malata (??e lo è ancora)
Maria is been sick (and she still is)

These facts will be discussed in the next chapter.

2 TENSE AND ASPECT IN SOME ROMANCE LANGUAGES

In Romance languages we find a rich system of verbal temporal inflections. For example, in languages like French, Italian and Romanian we find that different past forms are used to convey different temporal meanings. A brief chart of the tense forms for these languages is given below with an informal English morphological classification[1]

ITALIAN	**ROMANIAN**	**FRENCH**	**Morph. Class.**
Presente	Prezentul	Présent	Present
Passato remoto	Perfectul simplu	Passé simple	Past perfective
Imperfetto	Imperfectul	Imparfait	Past imperfective
Passato prossimo	Perfectul compus	Passé composé	Present perfect
Trapassato prossimo	Mai mult ca perfectul	Passé antérieur	Pluperfect

In the proposal I made in chapter 1, these different morphological tense forms were analysed in terms of different tense/aspect combinations (von Stechow (2000), Kratzer (1998)); at the end of chapter 1, it was pointed out that this analysis does not explain the morphological and semantic contrasts of state sentences in Romance languages. In this chapter, I will present some more interesting facts concerning the distribution of durative temporal adverbials and tense selection in habitual sentences. In particular, we will see that *for x time* and *since x time* durative temporal adverbials have a complementary distribution across different verb forms in some Romance languages and we will observe that this distribution changes when the sentence is interpreted habitually. We will moreover discuss tense selection in habitual and generic sentences. I will propose a new analysis of the different tense forms listed in the chart above in order to account for these facts. In particular, I will propose a new definition of tense according to which tense is sensitive to certain properties of its complement (a similar idea is found in de Swart (1998) where tenses are sensitive to the aspectual character of their complements) and I will argue that the verbal forms listed in the chart above are the morphological spell-out of two different tenses imposing some conditions

[1] We will not consider future tenses. This because it is debated weather we find some modal component in their meanings. This is not the case and Bonomi (1978) explains where the modal flavor of a future sentences is coming from. Bonomi argues that we should distinguish between the conditions for asserting a sentence from its truth conditions; given that we do not know the course of future contingent events, we do not have sufficient elements for making an assertion about them although there could be in principle truth conditions for the sentence. This would explain the epistemic use of future tenses as well. In any case, my proposal can be extended to future sentences independently from this problem by assuming the future tense to be a temporal variable whose denotation is only define for times which are after the speech time.

on the temporal homogeneity of their complements. In order to implement this idea, I will decompose the tense projection into a temporal variable, localising the described eventuality in the flow of time, and an homogeneity condition on the interpretation of the tense complement. The idea is that tense looks at its complement and licenses it if it satisfies a condition of temporal homogeneity: this means that tense itself has some influence on the aspectual interpretation of a sentence. Given these assumptions, the problematic facts presented in chapter 1, the distributive facts and the semantic ambiguities I will discuss in this chapter will follow straightforwardly.

2.1 Italian and French facts

In Italian, durative *per*- and *da*-adverbials are found in a complementary distribution in state sentences

***per*-adverbials**	***da*-adverbials**
(1) (a) ?? È buio per due ore (It) is dark for 2 hours PRESENTE	(2) (a) È buio da due ore (It) is dark since two hours PRESENTE
(b) ?? Era buio per due ore (It) was dark for 2 hours IMPERFETTO	(b) Era buio da due ore (It) was dark since two hours IMPERFETTO
(c) Fu buio per due ore (It) was dark for 2 hours PASSATO REMOTO	(c) ?? Fu buio da due ore (It) was dark since two hours PASSATO REMOTO
(d) È stato buio per due ore (It) has been dark for 2 hours PASSATO PROSSIMO	(d) ?? È stato buio da due ore (It) is been dark since two hours PASSATO PROSSIMO
(e) Era stato buio per due ore (It) had been dark for 2 hours TRAPASSATO PROSSIMO	(e) ?? Era stato buio da due ore (It) was been dark since two hours TRAPASSATO PROSSIMO

As you can see from the (1) sentences, *per*-adverbials combine with the *Passato Remoto*, the *Passato Prossimo* and the *Trapassato Prossimo* but not with the *Presente* and the *Imperfetto*. On the other hand, *da*-adverbials combine with the *Presente* and the *Imperfetto* but do not

with the *Passato Remoto*, the *Passato Prossimo* and the *Trapassato Prossimo* as we see in the (2) sentences.[2]

French[3] patterns with Italian in the distribution, as you can see below

***pendant*-adverbials**	***depuis*-adverbials**
(3) (a) ?? La fenêtre est sale pendant deux jours The window is dirty for 2 days PRESÉNTE	(4) (a) La fenêtre est sale depuis deux jours The window is dirty since 2 days PRESÉNTE
(b) ?? La fenêtre était sale pendant deux jours The window was dirty for 2 days IMPARFAIT	(b) La fenêtre était sale depuis deux jours The window was dirty since 2 days IMPARFAIT
(c) La fenêtre fut sale pendant deux jours The window was dirty for 2 days PASSÉ SIMPLE	(c) ?? La fenêtre fut sale depuis deux jours The window was dirty since 2 days PASSÉ SIMPLE
(d) La fenêtre a été sale pendant longtemps The window has been dirty for 2 days PASSÉ COMPOSÉ	(d) ?? La fenêtre a été sale depuis deux jours The window has been dirty since 2 days PASSÉ COMPOSÉ
(e) La fenêtre avait été sale pendant longtemps The window had been dirty for 2 days PASSE ANTÉRIEUR	(e) ?? La fenêtre avait été sale depuis deux jours The window had been dirty since 2 days PASSE ANTÉRIEUR

Exactly like in Italian, *pendant*-adverbials combine with the *Passé Simple*, the *Passé Composé* and the *Passé Antérieur* but not with the *Présent* and the *Imparfait*, as you can see from the (3) sentences. On the other hand, *depuis*-adverbials combine with the *Présent* and the *Imparfait* but not with *Passé Simple*, the *Passé Composé* and the *Passé Antérieur*, as shown in the (4) sentences. I will call these two classes of adverbials durative *for*-adverbials

[2] (1)a)-b) are fine under a habitual interpretation in an appropriate context. As we will see later, this is predicted by the proposal I am making.

[3] And Romanian as well. The only difference is that in Romanian bare durative adverbials belong to the *per/pendant* class while the prepositional *pentru*-adverbials (*for*-adverbials) are result state modifiers.

and durative *since*D-adverbials.[4]

Another interesting fact we want to account for, is that ongoing and habitual meanings are generally conveyed by the use of a morphological imperfective tense in Romance languages while terminative readings with the use of a morphological perfective tense, as shown by the sentences below:

(5) Alle tre Carlo <u>correva</u> nel parco [Past Imperfective]

At three Carlo ran-PASTimperfective in the park
Lit: (i) At three o'clock Carlo was running in the park
(ii) At three o'clock, Carlo used to run in the park

(6) Alle tre Carlo <u>corre</u> nel parco [Present]

At three Carlo runs-PRES in the park
Lit: (i) At three o'clock Carlo is running in the park
(ii) At three o'clock, Carlo runs in the park

(7) Ieri Carlo <u>corse</u> nel parco [Past Perfective]

Yesterday Carlo ran-PASTperfective in the park
Lit: Yesterday Carlo ran in the park

Interestingly, under a habitual interpretation, *for*-adverbials combine with morphological imperfective tenses, as shown by the sentences below

(8) Il venerdì Carlo <u>correva</u> nel parco per due ore [Past Imperfective]

The Friday Carlo ran-PASTimperfective in the park for two hours
Lit: Fridays Carlo used to run in the park for two hours

(9) Il venerdì Carlo <u>corre</u> nel parco per due ore [Present]

The Friday Carlo runs-PRES in the park for two hours
Lit: Fridays Carlo runs in the park for two hours

Additionally, when a *for*-adverbial measures the time span of the habit, habitual meanings are conveyed by the use of a morphological perfective tense, as shown by the Italian sentences

[4] Just to give a hint for grasping the intuitive meaning of the sentences below, *per/pendant*-adverbials correspond to the English durative *for*-adverbials, while *da/depuis*-adverbials do not have a counterpart in

below

(10) Leo ha preso il te`alle cinque per venti anni [Present Perferct]

Leo have-PRES take-PASTpart tea at five for twenty years
Lit: Leo used to have tea at 5 o'clock for twenty years

(11) Leo prese il te`alle cinque per venti anni [Past Perfective]

Leo take-PASTperf tea at five for twenty years
Lit: Leo used to have tea at 5 o'clock for twenty years

When a durative adverbial measures the time span at which the habit holds in the past, a past imperfective tense is bad, as we can see in the following sentences

(12) ?? Leo prendeva il te` alle cinque per venti anni [Past Imperfective]

Leo take-PASTimp tea at five for twenty years

(13) ?? Leo prende il te` alle cinque per venti anni [Present]

Leo take-PRESENT tea at five for twenty years

My proposal in short

In order to account for these facts (and some others to be presented in our discussion) I will assume that:

- *since*D-adverbials combine with temporal predicates to give temporally homogeneous predicates;
- *for*-adverbials combine with temporal predicate to give temporally non-homogeneous predicate;
- present and past imperfective tenses require their complements to be temporally homogeneous;
- past perfective tenses requires their complements to be temporally non-homogeneous.

This explains the distribution in sentences (1)-(4), (a)-(c). I will moreover assume that

- the perfect morphology in (1)-(4), (d)-(e) is the spell-out of a semantic tense combining

English; they rather correspond to the German *seit*-duration-adverbials described by Musan (2001).

with a temporally non-homogeneous predicate.

This explains the distribution in sentences (1)-(4), (d)-(e). Finally, we will observe that

- habits are temporally homogeneous.

This will explain the fact that habitual readings are conveyed by the use of the present or of the past imperfective tenses; when they undergo *for*-adverb modification, habits become non-homogeneous; this is the reason of the presence of the perfective morphology in the habitual sentences.

2.2 Italian and French tenses

In order to develop this analysis, I will propose that the temporal system of Italian, and French (and some other Romance languages, ie Romanian) has two lexical entries in its inventory of tenses: a tense selecting for temporally homogeneous predicates and a tense selecting for temporally non-homogeneous predicates. The insight is that, in these languages, present and the past imperfective forms are two forms of one and the same tense selecting for temporally homogeneous predicates, while the past perfective, the present perfect and the pluperfect forms are forms of a tense selecting for temporally non-homogeneous predicates. This idea goes back to an observation of the Latin grammarian Varro (116 B.C. - 27 B.C.), who argues in *De Lingua Latina*, *IX, 48* that we should assume a basic division of the Latin tense forms into two stems, *Infectum* and *Perfectum*. According to Varro, while the Latin *present* and *past-imperfective* verbal forms (like *lego* (I read-PRES) and *legebam* (I read-PAST.IMP)) are *Infecta* forms and are analogous to one another, the Latin past-perfective forms (like *legi* (I read-PAST.PERF)) are *Perfecta* forms and are to be opposed to the former (*see* Oldsjö (2001) for a further discussion). [5]

I will define the class of temporally homogeneous predicates as the class of those predicates having the sub-interval property, i.e. divisible, the class of temporally non-homogeneous predicates as the class of those predicates not having it (Bennett and Partee (1972)):

Given a temporal property *P* of type <i, t>,

(14) *P* is temporally homogeneous if

$$\forall i\,[P(i) \rightarrow \forall i'\,[\,i' \subset i \rightarrow P(i')]] \;\&\; \forall i\,[\neg P(i) \rightarrow \forall i'\,[\,i' \subset i \rightarrow \neg P(i')]]$$

[5] Vide: M. Terenti Varronis, (Varro), De Lingua Latina, LVI-LVIII, Liber IX.

(15) *P* is temporally non-homogeneous if

$\forall$i [*P*(i)$\rightarrow\neg\forall$i' [i'$\subset$ i $\rightarrow$ *P*(i')]] & $\forall$i [$\neg$*P*(i)$\rightarrow\neg\forall$i' [i'$\subset$ i $\rightarrow$ $\neg$*P*(i')]]

where i and i' are intervals.

Definition (14) is the definition of temporal homogeneity we gave in Chp.1. This definition is different from Bennett & Partee's (1972).[6] In my version I added a second conjunct to the definition. This second condition says that a temporal predicate is temporally homogeneous if, when false of a temporal interval is also false of every sub-interval of that interval. This follows from our intuition concerning the falsity of a state predicate. Consider the temporal predicate "*Mary be sick"*. According to our intuitions, if it false that Mary is sick at a temporal interval, let's say from 2 p.m. to 4 p.m. today, it is also false that Mary is sick at every sub-interval of that interval.

2.2.1 Tense architecture

In order to develop a tense architecture appropriate to the proposal I am making, I postulate that Italian and French (and Romanian) tenses are to be decomposed into an *homogeneity condition*, which distinguishes the Infectum from the Perfectum, and a *temporal variable*, which distinguishes the past from present and from the future. I will assume that the homogeneity condition is located in the head of the tense projection whose specifier position is filled by the time variable as represented by the trees below (I stick to the Italian classification just for simplicity)

[6] Bennett and Partee (1972) definition was the following:

A verb phrase α is a *subinterval* verb phrase iff α is main verb of a sentence β such that if $||\beta]||^{T,\upsilon,i}$ then, for every $j \subseteq i$, $||\beta]||^{T,\upsilon,j}$, where *j* and *i* are intervals.

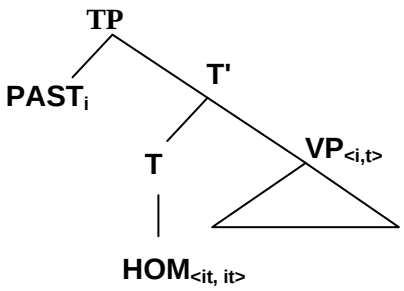
According to this definition

- *live* is a subinterval verb phrase

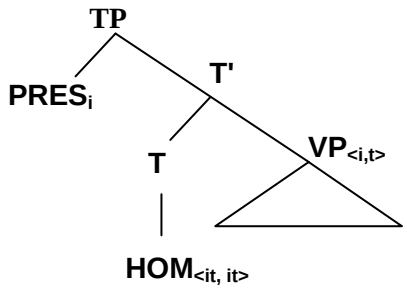
  if $||$Carlo live $||^{T,\upsilon,i}=1$ then for every $j \subseteq i$, $||$Carlo live $||^{T,\upsilon,j}=1$

I. TEMPORA INFECTA

Imperfetto

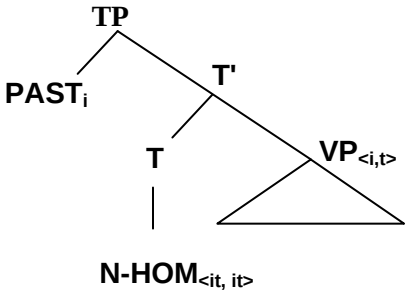


Presente

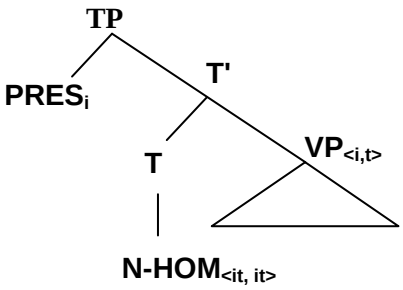


II. TEMPORA PERFECTA

Passato Remoto



Reporters Present?



According to this classification we find two classes of tenses in Italian: the class of the Temporal Infecta, whose tense head HOM requires the tense complement to be temporally homogeneous; the class of the Tempora Perfecta, whose tense head N-HOM requires the tense complement to be temporally non homogeneous. The *Perfect* constructions (*Passato Prossimo* and *Piuccheperfetto*) do not appear in charts I and II despite the fact that they fall in the classification above. This is because, depending on the aspectual class of the predicate they combine with, these forms are semantically ambiguous between the spell out of a tempus infectum and the spell out of a tempus perfectum. They will be discussed in section 2.4.

2.2.2 Homogeneity conditions and temporal variables

According to the tense architecture given in section 2.2.1, the head of the tense projection is a *predicate restriction*, namely, a partial identity function from predicates of times into predicates of times, *presupposing* its complement to be temporally homogeneous or not. The lexical entries of our tenses will therefore be

(16) HOM =: λPλt(P(t)): P is temporally homogeneous.

(17) N-HOM =: λPλt(P(t)): P is temporally non-homogeneous

As you can see from the tense architecture given in section 2.2.1, the predicate restriction associated with the Tempora Infecta is HOM, the one associated with the Tempora Perfecta is N-HOM; in the case of the Tempora Infecta, the predicate restriction HOM takes a predicate of times as its argument and it gives it back, if this latter is temporally homogeneous; in the case of the Tempora Perfecta, N-HOM takes a predicate of times as its argument and it gives it back, if this is temporally non-homogeneous. The denotation of the application of the predicate restriction to its complement will therefore be

(18) $||\text{HOM}(P)||^{g,c}$= {t ∈$||P||^{g,c}$:*P* is temporally homogeneous}; u. o.

(19) $||\text{N-HOM}(P)||^{g,c}$= {t ∈$||P||^{g,c}$:*P* is temporally non-homogeneous}; u. o.

As we will see later, The temporal predicate restrictions are what brings the contribution of tense into the aspectual interpretation of a sentence. The obtained property of times is, in turn, saturated by the denotation of the temporal pronoun occupying the TP-Spec position.

As for the definition of the temporal pronoun, I will assume Heim's (1994) straightforward semantics of tense we discussed in chapter 1, repeated below

(20) $||\text{PAST}_i||^{g,c}$ = g(i) when g(i) < t_c , undefined otherwise

(21) $||\text{PRES}_i||^{g,c}$ = g(i) when ¬g(i) < t_c , undefined otherwise

Let me say again what these definitions mean. Definition (20) says that the denotation of $PAST_i$ is defined if the value that the assignment function *g* assigns to the index *i* is a time before t_c, the time of the context of utterance; if it is defined, it is equal to the value that the assignment function *g* assigns to the index *i*. Definition (21) says that the denotation $PRES_i$ is defined if the value that the assignment function *g* assigns to the index *i* is a time <u>not</u> before t_c; if it is defined, it is equal to the value that the assignment function *g* assigns to the index *i*. We can now see how the system works. Consider the following sentence

(22) Mario era malato

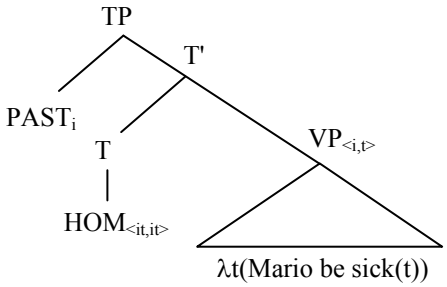
Mario was(*Imperfetto*) sick

The derivation of its LF will start from the state predicate *Mario be sick.* As I argued in chapter 1, the logical form of a state predicate has an explicit argument for times as follows

(23) λt(Mario be sick(t))

The state predicate is merged with the tense head and the obtained temporal predicate is in turn filled by the temporal pronoun $PAST_i$, as shown below

(24) $PAST_i$ (HOM(λt(Mario be sick(t))))



Given the definedness conditions introduced by the temporal variable and by the predicate restriction HOM, it results that (22) is defined if

(25) $||PAST_i||^{g,c}$ is defined,

and if

(26) $||HOM(\lambda t(\text{Mario be sick}(t)))||^{g,c}$, is defined,

that is, if $g(i) < t_c$, and if λt(Mario-be-sick(t)) is homogeneous, which is the case, since state predicates denote homogeneous properties of times. In this case,

(27) $||PAST_i$ (HOM(λt(Mario be sick(t))))$||^{g,c} = 1$ iff the time denoted by $PAST_i$ is a past time at which Mario is sick.

2.2.3 Durative *for*- and *sinceD*-adverbials

Contrary to G&P's (2001) analysis discussed in chapter 1, I will assume durative *for*- and *sinceD*-adverbials to be temporal modifiers, namely functions from time properties to time properties. Intuitively, while *for*-adverbials take a temporal predicate and they give it back by saying that it is true of an interval of a certain length (Dowty (1979)), *sinceD*-adverbials take a temporal predicate and, by introducing an *extended now* interval[7], they give back a predicate of times abutting an interval of a certain length of which the original temporal predicate is true (Musan (2000), Von Stechow (2002)). The interesting property of these adverbs is that while *for*-adverbials quantize the temporal predicate they modify, *sinceD*-adverbials make them homogeneous.

2.2.3.1 *For*-Adverbials

That *for*-adverbials turn all temporal predicates into quantized temporal predicates (which are, *a fortiori*, non-homogeneous) is easy to see. I will assume that *for*-adverbials introduce universal quantification over times (Dowty (1979))

(28) For x time := $\lambda P \lambda t(\delta_{TIME}(t) = x \ \& \ \forall t'(t' \subseteq t \rightarrow P(t'))$

where δ is function measuring the length of an interval onto a temporal scale.

The definition in (28) says that a *for*-adverbial takes a predicate of times *P* as its argument and it gives back a temporal predicate denoting a set of times *i*, which are *x* long, and for which every subinterval *j* of *i* belongs to the set of times denoted by the original predicate *P*. More intuitively, the adverb says that the predicate *P* is true of a x-long interval and of every subinterval of this interval. These adverbs quantize the temporal predicate they modify, namely they give a temporal predicate which, if true of an interval, is false of every proper subinterval of that interval[8]

[7] Dowty (1979) and McCoard (1978);

[8] Andrea Bonomi (p.c) objected that not every *for*-adverbial quantizes the temporal property it modifies as in the case of "per meno di due ore" (*for less than two hours*). I think that Bonomi is wrong and that we have to make clear what this adverb says. If you consider the following contrast it is clear that the adverb requires maximality of the temporal property it modifies

(a) Leo è stato malato per meno di due giorni ... ?? ed è ancora malato
Leo has been sick for less than two days ... ?? and he still is

(b) Leo è stato malato per due giorni... ed è ancora malato
Leo has been sick for two days ... and he still is

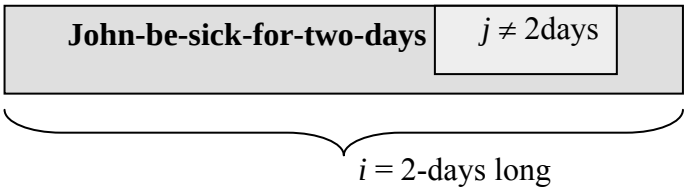
(29) *P* is temporally quantized iff $\forall i[P(i) \rightarrow \forall j\ [j \subset i \rightarrow \neg P(j)]]$

where i and j are intervals.

Notice that being quantized is different from being non-homogeneous given the different scope of negation in (15) and in (29). In fact, given a temporal predicate P, Quantized(P)→NON-HOM(P). Consider now the LF of the time predicate *John be sick for two days*, as represented below

(30) $\lambda t(\delta_{DAY}(t) = 2$ & John be sick (t) & $\forall t'(t' \subseteq t \rightarrow$ John be sick (t'))

As shown by the picture below, if (30) is true of an interval *i*, it is false of every proper subinterval *j* of *i* trivially because *j* cannot be two days long if it is properly included in *i*



This shows that *for*-adverbials quantize the temporal property they modify.

2.2.3.2 *SinceD*-Adverbials

SinceD-adverbials turn all temporal predicates into homogeneous temporal predicates. This is also very easy to see. As proposed by von Stechow (2002), these adverbials introduce an extended-now interval. I will assume a slightly modified version of von Stechow's definition of German durative *seit*-adverbials, which works better for Italian, French and Romanian

(31) since x time := $\lambda P \lambda t \exists I($ t abuts I & $P(I \cup t)$ & $\delta_{TIME}(I) = x)$

Thus, "to be sick for less than two days" intuitively means *to be maximally sick for less than two days*. The right definition of "for less than x time" will be therefore

(c) $\lambda P \lambda t[(\delta_{DAY}(t) \subset x$ & P(t) & $\neg \exists t'(t \subseteq t'$ & P(t')) & $\forall t''(t'' \subseteq t \rightarrow P(t''))]$

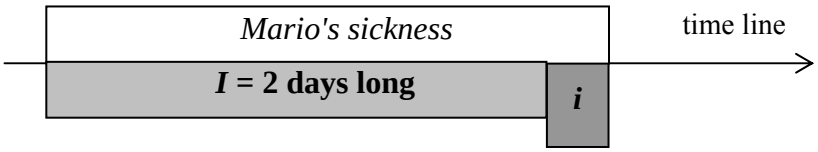
This temporal modifier quantizes the temporal property it modifies.

The definition in (31) says that a *sinceD*-adverbial applies to a temporal predicate P and it gives back a temporal predicate denoting a set of times *i* such that there is an x-time long interval *I* abutting *i* ("t abuts I" means that the right bound of *I* is the left bound of *t*) and the set union of *I* and *i* belongs to the set of times denoted by the original predicate P. Intuitively, it gives back a property of times abutting an x-long interval of which the original predicate is true. Consider now the Italian temporal predicate in (33) obtained by the application of the *da*-adverbial in (32) to the state predicate λt(Mario be sick(t))

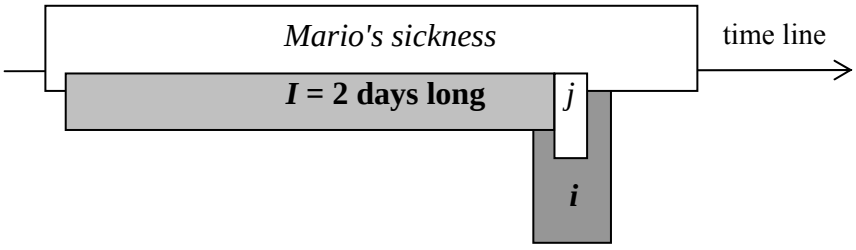
(32) da due giorni (*since two days*):= $\lambda P \lambda t \exists I(t \text{ abuts } I \ \& \ P(I \cup t) \ \& \ \delta_{DAY}(I) = 2)$

(33) $\lambda t \exists I(\ t \text{ abuts } I \ \&$ Mario-be-sick $(I \cup t) \ \& \ \delta_{DAY}(I) = 2)$

The temporal predicate in (33) denotes a set of times *i* abutting a 2-day long interval *I* for which Mario is sick at *i* plus *I*, as shown by the picture below



The "homogenizing" nature of *sinceD*-adverbials is easy to understand. Consider the picture below



If (33) is true of the interval *i*, it should be true of every subinterval *j* of *i*. Since the duration *two days* is relative to the time *I* introduced by existential quantification and not to *i*, and *I* abuts *j*, $I \cup j$ will always be included in $I \cup i$. Therefore, if Mario is sick at $I \cup i$, he is sick at $I \cup j$, and this shows that the obtained predicate is homogeneous.[9]

[9] Here the empirical question is whether the measuring function δ should apply to (I∪t) and not only to I, namely if the x-long interval should include the reference time introduced by the tense. If this is the case we have a potential problem while combining a since-D adverbial with a tempus infectum, since in this case the temporal

2.2.4 Tense and durative adverbials

While the quantizing character of *for*-adverbials explains why they do not combine with a Tempus Infectum but do with a Tempus Perfectum, the homogenizing nature of *sinceD*-adverbials explains why they combine with a Tempus Infectum, but not with a Tempus Perfectum. Consider the following Italian sentences where a *for*-adverbial combines with the Passato Remoto but not with the Imperfetto and the associated LFs

(34) Mario fu malato per due giorni

Mario was(P. Remoto) sick for two days

---

property obtained via since-D modification is no more temporally homogeneous. I emphasise that this is an empirical question. Sentences like the following can shed some light on the dilemma

a) Oggi sono malato da tre giorni
Today be-PAST.IMP-1sing sick since three days

According to what a) means, at the speech time included in today I am entering my fourth day of sickness, i.e. there is a three-day-long interval abutting now at which I am sick, and I am still sick now. Though the empirical intuitions about these facts can (hardly) be disputed, I think that this is only a potential problem for my proposal. There are some other facts suggesting that since-D adverbials deliver homogeneous properties of times. Here are some of these facts concerning an important property of the reference time abutting the interval I in meaning of these adverbials.

b) ??Ogni volta che Maria corse nel parco per un'ora Leo dormiva da due ore
Every time that Mary run-PAST.PERF in the park for one hours, Leo sleep-PAST.IMP since two hours

c) ??Ogni volta che Maria corse nel parco per un'ora Leo stava dormendo da due ore
Every time that Mary run-PAST.PERF in the park for one hours, Leo was sleeping since two hours

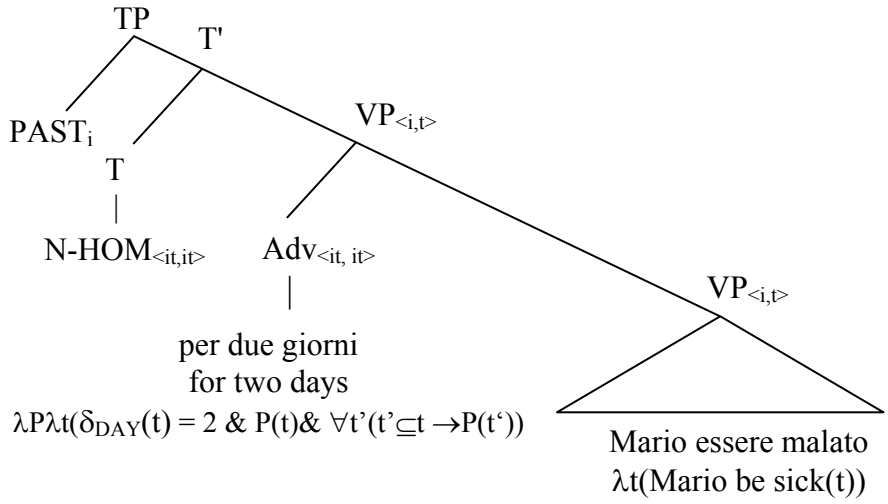
d) Ogni volta che Maria corse nel parco per un'ora Leo dormiva
Every time that Mary run-PAST.PERF in the park for two hours, Leo sleep-PAST.IMP

e) Ogni volta che Maria corse nel parco per un'ora Leo stava dormendo
Every time that Mary run-PAST.PERF in the park for two hours, Leo was sleeping

f) Ogni volta che Maria entrò Leo dormiva da due ore
Every time that Mary come-PAST.PERF in, Leo sleep-PAST.IMP since two hours

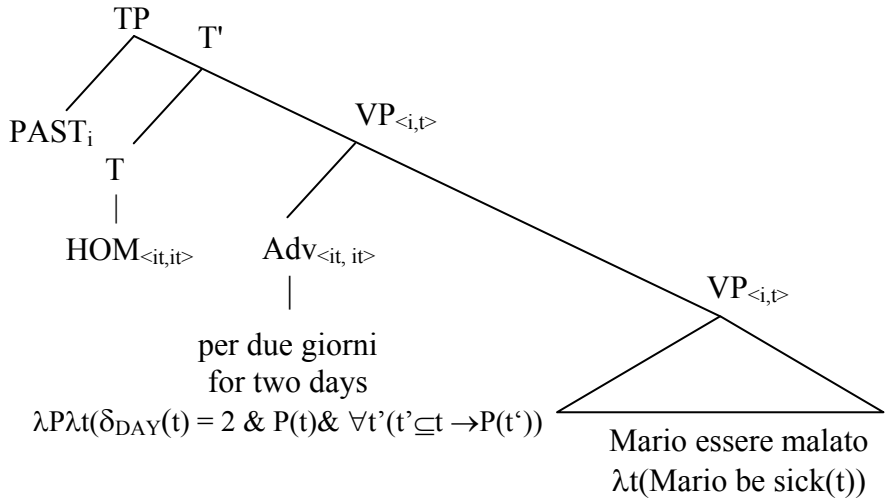
g) Ogni volta che Maria entrò Leo stava dormendo da due ore
Every time that Mary come-PAST.PERF in, Leo was sleeping since two hours

According to their relevant meanings, the temporal variables introduced by the tenses are bound by universal quantification in these sentences, their LF being something like: $\forall i[P(PAST_i) \rightarrow Q(PAST_i)]$. The contrast between (b)-(c), and (d)-(e) shows that when the reference time introduced by the tense in the embedded clause has some length (as required by the *for-one-hour* adverbial modification) the since-D adverbial in the embedded clause is bad. On the other hand, when the reference time is a point (as the case in (f) and (g) where the embedded clause describes a punctual event) the since-D adverbial modification is good. This shows that a since-D adverbial requires that the reference time abutting the interval I should be a point of time. If this is correct, since-D adverbial modification gives homogeneous properties of times since the property of a point is vacuously homogeneous, having a point of time no proper subparts by definition.



(35) ?? Mario era malato per due giorni

Mario was(Imperf.) sick for two days



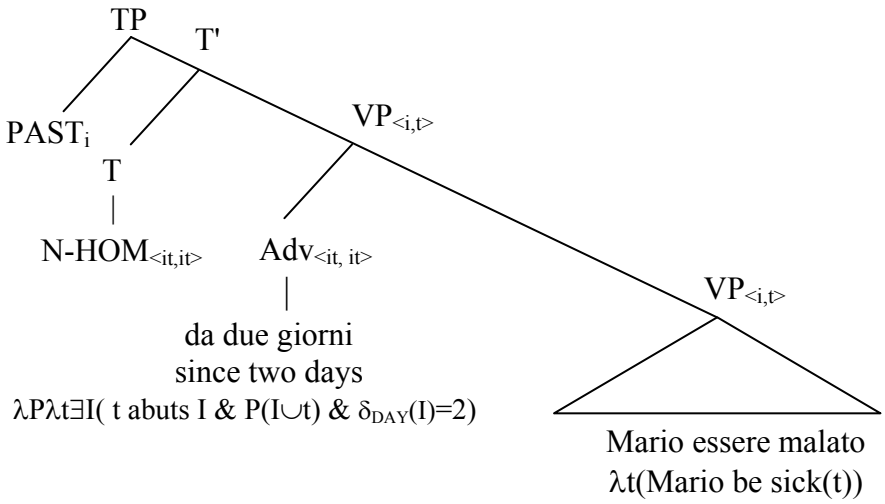
In both (34) and (35) we start the derivation of the LFs from the state predicate λt(Mario-be-sick(t)) and we obtain the non-homogeneous temporal predicate λt(δ$_{DAY}$(t) = 2 & Mario-be-sick(t) & ∀t'(t'⊆t → Mario-be-sick(t‘)) by *for*-modification. In (34) this temporal predicate is merged with the tense head N-HOM and in turn applied to the temporal variable *PAST$_i$*. The definedness conditions for the obtained sentence require the denotation of *PAST$_i$* to be a past time and λt(δ$_{DAY}$(t) = 2 & Mario be sick (t) & ∀t'(t'⊆t → Mario be sick (t‘)) to be non-homogeneous, which is the case. Therefore if *PAST$_i$* refers to a time before the time of the context of utterance, the sentence is felicitous when uttered in that context, and it is true if

and only if $PAST_i$ denotes a time which is two days long and is characterized by Mario's sickness. On the contrary, in (35) the presupposition carried by HOM cannot be met, since $\lambda t(\delta_{DAY}(t)= 2$ & Mario be sick (t) & $\forall t'(t' \subseteq t \rightarrow$ Mario be sick (t‘)) is temporally non-homogeneous. The "presuppositional-illness" of (35) is the cause of its ungrammaticality.

On the other hand, the homogeneous character of a temporal predicate obtained by *sinceD*-modification allows it to combine with the Imperfetto in Italian for the opposite reason, but it prevents it from combining with the Passato Remoto

(36) ?? Mario fu malato da due giorni

Mario was-P.Remoto sick since two days



As we see from its LF, sentence (36) suffers from presuppositional-illness, since the non-homogeneity presupposition carried by the N-HOM head cannot be met by the temporal property λt∃I(t abuts I & Mario-be-sick (I∪t) & δ_{DAY}(I) = 2), which is homogeneous. Clearly, such a temporal property combines with a Tempus Infectum, since it meets the homogeneity presupposition carried by the HOM head.[10]

State predicates combine however with the Passato Remoto without any overt *for*-adverbial modification, as shown by the sentence below

[10] In my proposal it is implicitly assumed that adverbials cannot have scope above the homogeneity restriction, namely that we cannot have something like PAST[IN x TIME[HOM[VP]]]; in order to avoid this unwelcome LF I have to postulate the following rule saying that tenses cannot be decomposed in the logical syntax: $||$ PAST+HOM $||^{g_c}$ = λP. HOM(P).λt.t<t_c.P(t) = 1.

(37) Mario fu malato

Mario was-PassatoRemoto sick

Interestingly, sentence (37) is ambiguous between a terminative and an inchoative reading. According to its inchoative reading, whose analysis will be given in section 2.3, sentence (37) says that Mario became sick in the past. According to its terminative reading, sentence (37) describes some of *Mario's sickness* which is entirely terminated in the past. I assume that this reading is obtained by the application of a covert operator which maximalizes the time at which the described state holds in order to meet the non-homogeneity presupposition associated with the Passato Remoto. The maximality operator is defined as follows

(38) MAX:= $\lambda P \lambda t(P(t) \& \neg \exists t'(t \subseteq t' \& P(t'))$

This operator maximalizes, and thus quantizes, the temporally homogeneous state predicate. As we said, a quantize predicate is non homogeneous. The application of MAX to the state predicate "Mario be sick" will give us the following LF for (37)

(39) $PAST_i(N\text{-}HOM(\lambda t(Mario\text{-}be\text{-}sick(t) \& \neg \exists t'(t \subseteq t' \& Mario\text{-}be\text{-}sick(t'))))$

According to (39), the application of the MAX operator correctly gives us that *Mario's sickness* is terminated in the past. On the one hand the application of the MAX operator gives the same quantizing effect as the application of *for* adverbials, but on the other hand, this latter is different from the former since it does not entail terminativity. In fact, nothing prevents *Mario's sickness* to hold up to the speech time given the LF associated with (34). At first glance, this would seem to be a an unwelcome prediction since in Italian we usually understand Passato Remoto sentences to describe events which are no more going on at the present. However, if we have a brief look at data available in the net we do find sentences like

(40) La cupola del Brunelleschi fu per lungo tempo, ed è ancora, il simbolo visivo dell'intera città. [www.operaduomo.firenze.it/storia/ spazio/spaziosacro7.htm]

The cupola from Brunelleschi was-Pass.Remoto for long time, and it is still, the symbol visual of-the whole city.

which require the *for*-modified states not to be necessarily terminated before the speech time. I explain the fact that we understand the eventuality as terminated in the past as an effect of

pragmatic factors associated with *for*-adverbials: since *for*-adverbials are upward entailing (*John was sick for three days* entails *John was sick for two days*), in order to be maximally informative, the length indicated by the *for*-adverbial should be the length of the maximal interval for which the predicate is true. This explains why we intend that *Mario's sickness* is terminated in the past while processing the temporal meaning conveyed by (34).

2.3 Homogeneity and Event Predicates

Until now, I have discussed state predicates which I have assumed to denote properties of times. In chapter 1 we argued for a basic distinction between state predicate and event predicate and we assumed that while a state predicate has an explicit argument for times, an event predicate has an explicit argument for events, as shown again below

State Predicate:

(41) || to love || := λyλxλt(love(t)(x)(y))

Event Predicate:

(42) || to sleep || := λxλe(sleep(e)(x))

As has been illustrated, since a state predicate like the one in (41) denotes a property of times and belongs to the logical type <i, t>, it can be modified by a durative temporal adverbial or saturated by tense; on the contrary, since an event predicate like the one in (42) denotes a property of events and belongs to the type <e, t >, it needs to be type shifted to combine with a temporal adverbial or tense. As I argued in chapter 1, implicit aspectual operators are responsible for the type shifting of event predicates by localizing the described event with respect to a time. Following Kratzer's and von Stechow's definitions of aspect, we assumed that the common Romance aspectual operators are the inclusion operator, and its converse. Let us discuss them again in order to clearly understand how they are connected with the temporal homogeneity proposal I am making. The inclusion operator, which is called *Perfective* operator since it is responsible for the perfective reading of an event sentence, localises the described event within a time: it takes a property of events and it gives back a property of times including the temporal trace of the event. Its complement, which is called *Imperfective* operator since it is responsible for the imperfective reading of an event sentence, localises the described event as surrounding a time: this operator takes a property of events and it gives a property of times properly included in the temporal trace of the event. The

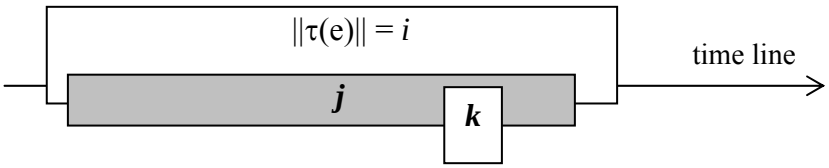
definitions we gave for the aspectual operators are given again below

(43) Perfective =: ||PFV|| = λPλt∃e(t ⊇ τ(e) & P(e))

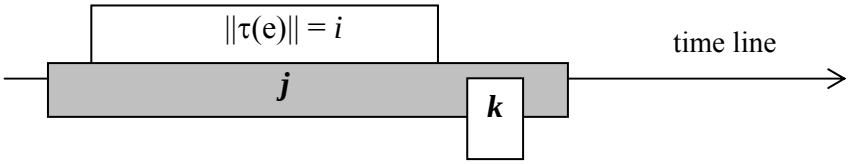
(44) Imperfective =: ||IPV|| = λPλt∃e(τ(e) ⊃t & P(e))

where τ is a function taking an event and giving its temporal trace.[11]

According to what (43) and (44) say, a temporal property formed via the IPV operator will always be homogeneous, as shown by the picture below



This is because, if *j* is included in the temporal trace of *e*, every subinterval *k* of *j* will also be included in it; therefore we expect a temporal property formed via the IPV operator to combine with a Tempus Infectum. On the other hand, a temporal property formed via the PFV operator will always be non-homogeneous, as shown by the picture below

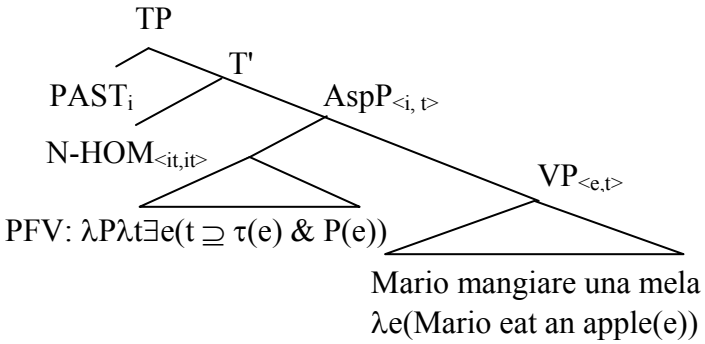


As we can see, if *j* includes the temporal trace of *e*, it is not the case that every subinterval *k* of *j* will include the temporal trace of *e*; therefore we expect a temporal property obtained via PFV operator to combine with a Tempus Perfectum. Now, consider the following Passato Remoto event sentence and its associated LF

(45) Mario mangiò una mela

Mario eat-P.REMOTO an apple

[11] In (44) we do not consider the modal aspect of the Imperfective aspect discussed in Bonomi (1999) since it clearly goes beyond the purpose of the present chapter. It will be discussed in chapter 3.



The temporal predicate obtained via the PFV operator meets the non homogeneity condition associated with the N-HOM head. This explains why event sentences have terminative interpretations under the Passato Remoto, as shown by the bad continuation of the sentence below

(46) Mario mangiò una mela, *e la sta ancora mangiando

Mario eat-P.REMOTO an apple, *and it he-is still eating

The Passato Prossimo (perfect) and the Trapassato Prossimo (pluperfect), which will be discussed in Section 2.4, behave analogously, as shown by the sentence below and its bad continuation

(47) Mario ha mangiato una mela, *e la sta ancora mangiando

Mario has eaten an apple, *and it he-is still eating

Going back to state predicates, in section 2.2.4 I have mentioned that they are ambiguous between a terminative and an incohative interpretation when they combine with a past perfective tense in the Romance languages. Consider again the following Italian sentence where the state predicate *be dark* combines with a past perfective tense

(48) Fu buio

(It) was-P.Remoto dark

This sentence is ambiguous. It can be used to convey that there is some past terminated darkness state or that it became dark in the past. In section 2.2.4 we argued that the terminative reading is be obtained via a maximalization of the state predicate in order to meet

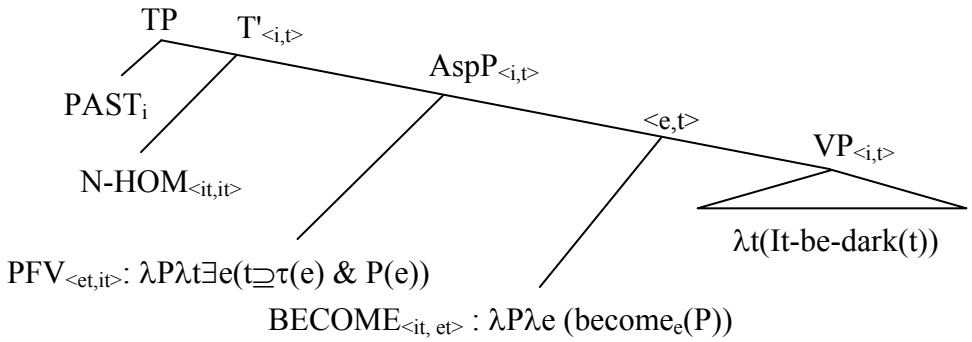
the non-homogeneity condition associated with the past perfective tense. In order to account for the inchoative reading, I propose a similar explanation. In order to meet the non-homogeneity condition associated with the past perfective tense, I assume the inchoative reading to be obtained by the application of the covert "achievementizing" operator below

(50) BECOME =: $\lambda P \lambda e$ ($become_e(P)$)

- the event *e* is a becoming with result P, where P is a state.[12]

As shown by the LF of (48) represented in (51) below, the temporal predicate obtained via the *become* operator is in turn perfectivized and selected by the past perfective tense

(51)



(52) $PAST_i$ (N-HOM ($\lambda t \exists e(t \supseteq \tau(e)$ & become(It-be-dark))))

Under its inchoative reading, the sentence is true if and only if g(i) is a past time including the time of a becoming dark event. Interestingly, the analysis predicts that the result state can hold up to speech time since the embedded state of result is not temporally constrained, as shown by the sentence below (Bertinetto (2001))

(53) La sua squadra preferita aveva perso. Gianni ne ebbe un forte mal di pancia che ancora non gli è passato.

His preferred team had lost. Because of this, Gianni got a belly ache, which is still paining him.

[12] A formal definition for "became" will be given in 2.4.

2.3.1 Event predicates and *for*-adverbials

It is a known fact, that *for*-adverbials combine with atelic predicates but not with telic ones. Given Dowty's definition of *for*-adverbials, the explanation of this fact runs as follow in the system I am proposing. Given that *for*-adverbials are temporal modifiers and they introduce universal quantification over subintervals, they combine with state predicates which denote homogeneous properties of times. As we have seen, the temporal property obtained by the application of a *for*-adverbial is quantized and it meets the non-homogeneity presupposition associated with a tempus perfectum. Event predicates denote properties of events and they cannot combine directly with a temporal modifier such as a *for*-adverbial. They must be type shifted into a time predicate by the application of the aspectual operators as we have seen in chapter 1 before they can combine with tense or with a temporal modifier. According to the definition given in (43), the PFV operator requires $t \supseteq \tau(e)$, namely, that the temporal trace of the event is either properly included or equal to the time *t*. According to these conditions, when the temporal property is obtained via the proper-inclusion relation, it is non-homogeneous, and it does not meet the universal quantification associated with *for*-adverbials. Thus, it does not combine with a *for*-adverbial. When the relation associated with PFV is the identity relation, the homogeneity character of the obtained temporal property depends on the homogeneity character of the event predicate that the PFV operator modifies; thus, a temporal property obtained via the identity relation combines with a *for*-adverbial depending on the homogeneity character of the modified event property. When the event predicate is telic, like *build a house* (see the discussion about telic predicates and interval semantics in chapter 1), it is non-divisible (i.e. non homogeneous). In this case, a subinterval of the temporal trace of the event for which this predicate is true is not the temporal trace of an event of the same type. In this case, the temporal property obtained via the PFV operator under the identity relation will be non homogeneous; therefore, the temporal property obtained via the identity relation from a telic event predicate does not combine with a *for*-adverbial; this is because the obtained temporal property does not meet the universal quantification introduced by this adverbial.[13] When the event predicate is atelic like *sleep* (and thus divisible down to a certain point), the temporal property obtained via the PFV operator under the identity relation will be homogeneous (down to a certain point); therefore, a

[13] Actually, in the case of achievement predicates the explanation runs differently. In fact, the temporal trace of an achievement predicate, which denotes a punctual event, is the property of a point of time. This property is vacuously homogeneous and it satisfy the conditional associated with the universal quantification introduced by *for*-adverbials. The reason why a temporal property obtained via the identity relation from an achievement

temporal property obtained via the identity relation from an atelic event predicate combines with a *for*-adverbial; this because it meets the universal quantification introduced by the adverbial.[14] This explains why activity predicates such as *sleep* combine with a *for*-adverbial but telic predicates such as *build a house* do not under PFV. More generally, this explains the distribution of *for*-adverbials across the different Vendlerian verb classes under PFV. Let us consider IPV modification now. According to the definition of IPV given in (44), every event predicate can combine with a *for*-adverbial under IPV. This because IPV requires that $t \subset \tau(e)$. According to this condition, the temporal property obtained via IPV is the property of *being a time properly included in the temporal trace of an event*. This temporal property is homogeneous and it meets the universal quantification introduced by a *for*-adverbial. This shows that every event predicate can in principle combine with a *for*-adverbial via IPV under a tempus perfectum. This prediction is borne out by the following Italian facts

(54) Tullio disegnò il suo ritratto per circa dieci minuti; poi dovette smettere

Tullio drew his portrait for circa ten minutes; then he had to stop. (Bertinetto (1991))

Here the *for*-adverbial modifies a subinterval of the temporal trace of *Tullio's drawing his portrait* event. *Tullio draw his portrait* is an accomplishment predicate and the event it denotes in (54) is not completed, as shown by the continuation. Notice that in (54) the tense morphology is past perfective though the semantic aspect occurring in its LF is IPV; to make it clear, see the LF for (54) below[15]

(55) [PAST N-HOM for 10 minutes IPV Tullio draw his portrait]

This fact shows that the tense morphology is not depending on the semantic aspectual operator. As we have seen in (54), a tempus perfectum can combine with a temporal property obtained via the IPV aspectual operator if this property is made non-homogeneous by *for*-adverbial modification. It is the presence of the adverbial, that quantizes the temporal predicate obtained via IPV, that requires a tempus perfectum. One important question

predicate does not combine with a *for*-adverbial is that the temporal trace of an achievement event does not have sensible length to be measured by *for*-adverbials.

[14] This does not work anymore if we assume that PFV maximalizes the event properties it modifies as stipulated in the redefinition of the PFV operator we gave in (128) in chapter 1 while discussing the terminative interpretation of event sentences in the simple past.

concerning these facts is why sentences like (54) are a little odd without an appropriate context or when uttered without a pragmatic relevant continuation like the one in (54). This is explained by pragmatic factors associated with the meaning of *for*-adverbials. As we have seen before, since *for*-adverbials are upward entailing (*John ran in the park for five minutes* entails *John ran in the park for four minutes*), in order to be maximally informative, the length indicated by the *for*-adverbial should be the length of the maximal interval for which the predicate is true. Under IPV this last condition is not met. For this reason sentences like (54) are odd without an appropriate context. However, pragmatic principles can be violated, and this can happen in appropriate contexts, like the one in (54).

2.4 The Perfect in some Romance Languages

As we have seen in (1) and (2), the presence of the Perfect changes the distribution of the adverbials under the same tense morphology (borne by the auxiliary verb). In recent work, von Stechow (2002) argued that the Present Perfect morphology in (d) is a variant of the past perfective inflection in Romance languages and he suggested that the same temporal meaning can be spelled out by the past perfective or by the Present Perfect in languages such as Italian (see also Hornstein (1990)). While, on the one hand, this proposal correctly predicts the adverbial distribution in (d), on the other hand, it does not seem entirely appropriate if one considers the contrast below

(56) Maria sposerà un uomo che ha vissuto a NY.

Maria marry-3singFUT a man who have-3singPRES lived in NY.
Lit: Maria will marry a man who has lived in NY.

(57) Maria sposerà un uomo che visse a NY.

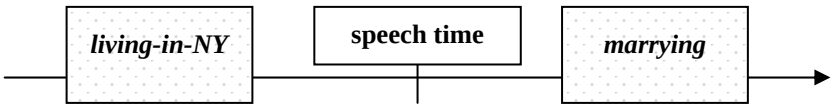
Maria marry-3singFUT a man who live-3sing.PassatoRemoto in NY.
Lit: Maria will marry a man who lived in NY.[16]

Sentence (56) is temporally ambiguous. It can mean: (i) that Mary will marry a man in the future with respect to the speech time and that this man lives in NY in the past with respect to

[15] IPV is here required by the semantics of the temporal adverbial which introduces universal quantification over subintervals; The prediction is important here since the analogous English example in ungrammatical **Tullio drew his portrait for ten minutes; then he had to stop*.

the speech time; or (ii) that Mary will marry a man in the future with respect to the speech time and that this man lives in NY in the past with respect to the future *marrying* event (thus his living in NY may be in the future with respect to the speech time), as represented by (58) and (59) below

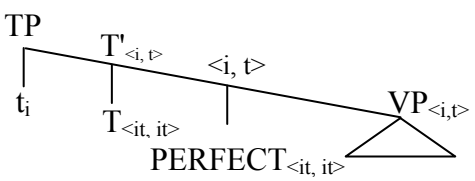
(58)



(59)

On the contrary, sentence (57) is not temporally ambiguous. According to what (57) says, the *living-in-NY* can only be in the past with respect to the speech time, i.e., (57) can only have the temporal interpretation represented in (58). If we consider the Past Perfective and the Present Perfect morphology to be free spell-out variants of one and the same tense while conveying (58), we have to stipulate that the Present Perfect is semantically ambiguous in order to account for the meaning variations of (56). In other words, we have to assume that under the reading (59) the Present Perfect is the spell-out of something else. One way of getting rid of this ambiguity is to assume that the perfect morphology in (56) is the spell-out of a Priorean (Prior 1957) *temporal operator* in the scope of the present tense as represented below

(60)



(61) PERFECT:= λPλt∃t'[t'<t & P (t')] : P is temporally non-homogeneous.

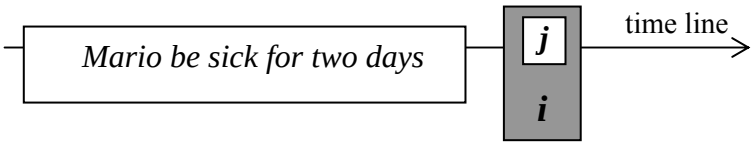
The definition in (61) says that the perfect takes a time predicate as its argument and gives a predicate of the times which are after a certain time at which the original temporal predicate

[16] Actually, this is not a good translation for the Italian (57) since the English sentence is ambiguous between

holds, and it presupposes this latter to be temporally non-homogeneous. As observed by von Stechow (2002), the Perfect as defined in (61) can be seen as the object language representation of the truth conditions of the Priorean past operator, since it introduces an existential quantification over times preceding the time denoted by tense. By introducing existential quantification, the Perfect turns all the predicates it modifies into temporally homogeneous predicates. Let us illustrate this. Consider the following temporal property obtained by Perfect modification from the temporally quantized predicate *Mario essere malato da tre giorni* (*Mario be sick for two days*)

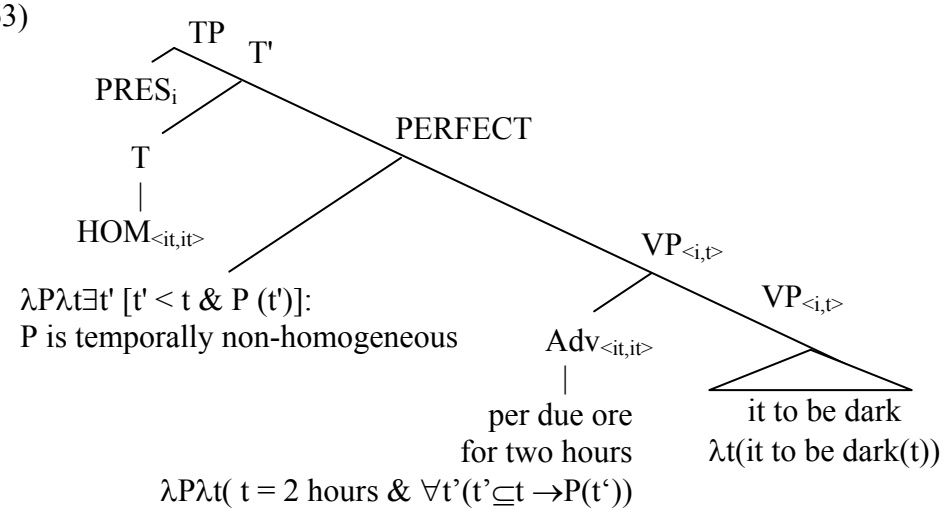
(62) $\lambda t \exists t'$ [t' < t & Mario be sick for two days (t')]

As shown by the picture below, if (62) is true of a interval *i*, it is true of every subinterval *j* of *i*, trivially because an interval which is before another interval is before every subinterval of that interval



According to this proposal, the LF associated with (1)d. will be therefore

(63)



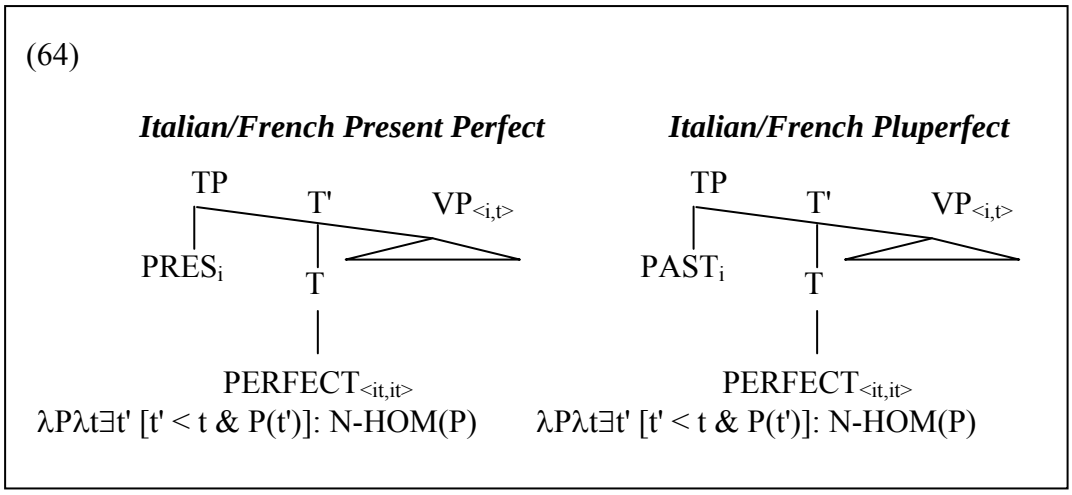
In this analysis, the difference between the Present Perfect and the Pluperfect will depend on whether we find a past or a present temporal pronoun in the Spec-TP position. The

(58)(59) readings (see Abusch 1996).

ungrammaticality of the Italian d-e sentences in (2) and the French d-e sentences in (4) follows from the non-homogeneity presupposition we associated with the Perfect in (61). Since the Perfect presupposes its complement to be non-homogeneous, it cannot combine with a temporal predicate obtained via a *sinceD*-adverbial; this non-homogeneity presupposition is moreover responsible for the fact that eventualities described under the Perfect get a terminative interpretation in Italian.

One weak point of this proposal is that our durative temporal adverbials should always occur in the scope of the perfect. This is an unnatural stipulation and I think it is a sign that our description of the perfect is not yet entirely correct. In our analysis, we have so far described the perfect as a temporal operator in the scope of the tense (this is the standard analysis for perfect constructions in English). I think that the scope stipulation is an indication that this cannot be correct. A way of presenting this stipulation as less unnatural in our system is to assume that the perfect is a special predicate restriction as defined in (17), namely a special tense head selecting for temporally non-homogeneous predicates, whose specifier position is filled by a past or a present time variable as represented below

(64)



Given that in section 2.2.4 we assumed that tenses cannot be decomposed in the logical syntax, we will derive the correct scope order in which temporal adverbials are always in the scope of the perfect.

This analysis accounts for what has been called the "inclusive meaning" (Bertinetto, 1986) of the Italian present perfect illustrated by the sentence below[17]

(65) Finora ho abitato a Torino (Bertinetto, 1986)

Until-now have-PRES1sin lived in Torino

According to what (65) says, there is a past interval, which ends now, at which the speaker lives in Torino. I will assume this temporal meaning to be obtained as a result of the interaction of the temporal information conveyed by the use of the *finora* (until now) adverbial occurring in the scope of the perfect and of some pragmatic factors concerning state predicates such has *to live*. Given the following definition of Romance *untilNOW*-adverbials

(66) untilNOW (finora) := λPλt(P(t) & t abuts NOW)

the correct LF for (65) will be

(67) ∃t' [t' < $PRES_i$ & (I-live-in-Torino(t') & t' abuts NOW)]

Notice that the adverbial defined in (66) makes the temporal predicate it modifies non homogeneous: this is because, if the temporal property obtained via the untilNOW modification is true of an interval, this interval should abut the speech time; clearly, it is not true that every sub-interval of this interval abuts the speech time. The temporal predicate *Io abitare finora a Torino* (I to live until-now in Torino) is therefore non-homogeneous and meets the non-homogeneity presuppositions associated with the perfect. Because of its "non-homogeneizing" nature, these adverbs do not combine with a tempus infectum, as shown below

(68) ?? Finora abito a Torino

Until-now live-PRES1sing in Torino

(69) ?? Fino ad allora abitavo a Torino

Until to then live-PASTimperf1sing in Torino

As in the case of *for*-adverbials, these adverbs do not maximalize the temporal predicate they modify. The embedded temporal predicate, in our case *Io abitare a Torino* (I to live in Torino), is therefore free to hold of an interval that is bigger than the one introduced by the perfect; this means that the embedded temporal predicate can extend up to the speech time. In fact, (65) can be truly uttered in a situation in which the speaker is leaving in Torino at the speech time. The LF (67) is therefore compatible with both a situation in which the speaker

[17] And given the analogies between French and Italian, of the French "inclusive meaning" too.

does live in Torino at the speech time and with one in which it is not true that he lives in Torino at the speech time. This second reading associated with (65) is more marginal. The explanation for this fact is again a pragmatic one. *To live in Torino* is not a situation that you can change with a punctual event. So, if you have been living in Torino just before now, I will infer that you still do live in Torino right now and that you will still live in Torino just after now. This is what makes the second reading of (65) pragmatically not accessible. That the *including now* effect is a pragmatic effect depending on the verb meaning is clear if we consider the sentence below, uttered in the following situation

SITUATION: I went out for a beer with my friends and I left my children at home with the baby-sitter. I came back and when I entered the room the children started crying. The baby-sitter says:

(70) Finora sono stati bravissimi

Until-now have-PRES3Plur been quiet

Be quiet is a state that one can change in a snapshot; according to my experience, a child can suddenly start crying or doing funny things. The reading according to which the described event is not holding at the speech time is in this case pragmatically accessible. The sentence means, in fact, that there is a past interval which abuts now at which the children were quiet. Notice that it is the presence of the adverbial that is responsible for the *including now* interpretation of sentence (65). Consider the sentence below

(71) Ho abitato a Torino

have-PRES1sin lived at Torino

As Bertinetto (1986) observes, when the adverb is not there the sentence means that there is a past time at which the speaker lived in Torino. This is explained in our system: in order to meet the non-homogeneity presuppositions associated with the perfect, we maximalize the temporal predicate. If the predicate is maximalised it cannot hold of an interval which is bigger than the interval introduced by the perfect. Since we find a non-homogeneity presupposition associated with the Italian passato remoto (and French passé simple) we expect temporal property obtained via the *untilNOW*-adverbial modification to combine with this tense as well. This is borne out by facts

(72) Giuro, fino ad allora fui una madre esemplare.

I swear, until to then was-PASTperf1sing a mother exemplar.
LIT: I swear, until then I have been an ideal mother.

Let me tell it once again; in (65) the adverb requires the interval introduced by the perfect to abut the speech time, and the including now interpretation is dependent on pragmatic factors concerning the verb meaning. Given that *to abut* is a limit case of *to proceed*, the meaning conveyed by (65) is analysed as a limit case of the one conveyed by (71) (forced by the presence of the adverbial). This suggests that there is no *extended-now* meaning of the perfect in Italian (and French). Namely, the perfect does not introduce an interval whose right boundary is the speech time (or a generic referent time). This seems to be correct if we consider the fact that, in some Romance languages, this meaning is conveyed by the use of the tempora infecta combined with the *sinceD*-adverbials and not by the perfect as in English, as shown below

(73) I have lived in Torino for two years

The extended-now reading of (73), i.e. the reading for which there is a two-year-long interval abutting now at which the speaker lives in Torino, is conveyed by the use of the present tense plus the durative *da due anni* (since two years) adverbial in Italian

(74) Vivo a Torino da due anni

(I) livePRES in Torino since two years

Going back to a more general discussion, it is however not true that durative *sinceD*-adverbials do not combine with the Perfect at all. In fact they do when the predicate is a change of state predicate

(75) Il Parco Disney Studios ha aperto i cancelli da sei ore

The Park Disney Studios has opened the gates since six hours

(76) Le Disney parc a ouvert le portail depuis 6 heures

The Park Disney has opened the gate since six hours

Sentence (75) (as well as the analogous French in (76)) says that the Disney Park opened its gates, and that the gates have been open for six hours (up to now); in (75), the adverbial modifies the state brought about by the completion of the opening event and it says that this state holds for a six-hours-long interval abutting the speech time.

In order to give a correct analysis of sentences like (75), I will argue that the perfect morphology is ambiguous between the spell-out of a special Tempus Perfectum, as defined in (64), and the spell-out of a result state construction, in some Romance languages. The perfect morphology in (75) and (76) is the spell-out of the latter: it introduces a state of result brought about by the completion of a telic event which can be modified by temporal adverbials or saturated by tense.

That the perfect is ambiguous between these two meanings is clear if we consider the contrast between the two sentences below

(77) Alle tre, il Parco Disney Studios ha aperto i cancelli da 6 ore

At three o'clock, the Park Disney Studios has opened the gates since six hours

(78) Alle tre, il Parco Disney Studios ha aperto i cancelli per sei ore

At three o'clock, the Park Disney Studios has opened the gates for six hours

In (77) and (78), *sinceD*- and *for*-adverbials[18] modify the result state brought about by the completion of the opening event but, interestingly, in (78) the adverb *alle tre* (at three o'clock) localises the opening event, while in (77) it localises the right bound of the result state (the being open of the gates). This is a clear indication of the fact that the perfect conveys two different meanings in the two sentences: in (77) it localises the *at-three-o'clock opening* event in the past with respect to speech time, while in (78) it introduces the state of *being open of the gates*.

One might object that the contrast we have shown does not prove anything, since these facts could be explained by assuming that the perfect morphology in (75) and (76) is the spell-out of a temporal operator introducing the post state of the opening event, namely the forever holding state of the opening event having culminated which Parsons (1990) calls *resultant state*, and that this post state is what is modified by the *sinceD*-adverbial. This explanation cannot be correct if we consider the unavailability of the continuation of (75) below

[18] See Piñón (1999) and von Stechow (2000) for a discussion about result state modification and *for*-adverbials.

(79) ?? Il Parco Disney Studios ha aperto i cancelli da sei ore ma la polizia li ha chiusi un'ora fa.

The Park Disney Studios has opened the gates since six hours, but the police has closed them one hour ago

Sentence (79) shows that the *sinceD*-adverbial does not modify the post state of the opening event but rather its result state, since the gates should be open at speech time according to what the sentence says.

In order to account for these facts, it has been recently argued that there are two classes of telic predicates, those that have an accessible result state, e.g. *to open the gates*, and those that do not, e.g. *to send a letter* (Kratzer (2000) and Stechow (2002)). According to this analysis, only the former should occur in perfect of result constructions. This analysis does not seem entirely convincing if we consider an Italian sentence like

(80) Mario ha spedito il suo articolo da una settimana

Mario has sent his paper since one week

According to von Stechow and Kratzer sentence (80) should not convey a result state meaning. But we have seen that sinceD-adverbials do modify result states in Italian; therefore the predicate "spedire un articolo" (*to send a paper*) should give us an accessible result state when appearing under the perfect. On the other hand, it is clear that if we say that both "spedire un articolo" (*to send a paper*) and "aprire i cancelli" (*to open the gates*) have an accessible result state, we have to say why for-adverbials can modify the former but not the latter, as shown by the contrast between the sentences below

(81) ?? Mario ha spedito il suo articolo per una settimana

Mario has sent his paper for one week

(82) Il Parco Disney Studios ha aperto i cancelli per sei ore

The Park Disney Studios has opened the gates for six hours

In order to explain this fact, I will assume that *for*-adverbials presuppose the result state they modify to be reversible. We need a modal definition here. A first approximation of the

definition of state reversibility is the following: for every contingent property and actual time *t* for which the property is true, there is a time after *t* for which the property is possibly not true. In order to make clear what the definition says we have to define what "contingent" and "possibly not true" mean. Since these are modal predicates we need to relativize the definition to a set of possible worlds and we have to give an accessibility relation among them. We can assume that possible words have a common past and we can assume a circumstantial accessibility relation for the future in the following way:

(83) w R_i w' iff w and w' are identical until time i and w' is accessible in w at i given the relevant facts

(83) b. State Reversibility:

S is a reversible state iff $\forall t(S(t) \rightarrow \exists t'(t<t' \ \& \ \Diamond\neg S(t')))$

Definition (83)b. says that a state *S* is reversible iff for every time *t* for which the state is true there is a time *t'* after *t* such that it is possible that *S* is false at *t'*.[19] The reversibility presupposition associated with *for*-adverbials prevents these adverbials from combining with non reversible result states like *to be dead*, or *to be sent*.

In order to give an analysis for (75) and (76), we have to formulate a definition of *change of state predicates* which gives us the correct result when occurring in result state constructions. In recent work, Kratzer (2000) and von Stechow (2002) have proposed two alternative but similar definitions of accomplishment predicates sensitive to result state modification. While in Kratzer's analysis transformative predicates denote relations between *events* and *individual states* having a certain property, in von Stechow's they denote relations between *events* and *properties of states* (in order to account for the different meanings of adverbs modifying causative verbs (see also Stechow (2000)). Both Kratzer and von Stechow assume then that special operators called *aktionsart choosers* convert this relation into an event predicate or into a state of result predicate. Given that in my system I have assumed states not to be primitive entities but state predicates to denote property of times, if we follow Kratzer's proposal we come up with the counterintuitive result that transformative predicates denote a causative relation between events and times having a certain property as defined below

[19] This is a first approximation.

(84) to open := λxλeλtλt'(CAUSE(e, t) & open(x)(t'))

The only way of making sense of this in the system I am proposing is to assume Lewis's idea that times are event slices of a world; we shall avoid going into such a discussion which would be otiose to our aims. On the other hand, if we follow von Stechow's proposal and we reformulate his definition of transformative verbs in temporal terms, we obtain the following more intuitive definition which integrates more naturally into the proposal I am making without touching any ontological question about the nature of time

(85) to open:= λxλyλeλP(CAUSE(e,P) & Become(e,P) & Agent(e,y) & P=open x),

where P is a state

However, (85) does not give us the right results when we apply to it the "aktionsart choosers" described in (87) and (88) below and we try to calculate the truth condition of the "CAUSE" proposition. This is because, according to (85), transformative verbs denote causal relations between events and sets of times. Chierchia (p.c) suggested[20] to me that a possible way of representing transformative predicates in the system I am proposing in this chapter is to assume them to denote complex relations between an event and a time which abuts the temporal trace of the event whose result state holds at that time, as described below[21]

(86) to open:= λxλyλeλt(t><τ(e) & CAUSE(e, open(x)(t)) & Agent(e,y))

Extending Kratzer's and von Stechow's proposals to the our analysis, the relation in (86) is converted into an event predicate or into a result state predicate by the application of the following "aktionsart choosers", which I redefined in temporal terms

AKTIONSART CHOOSERS

(87) RESULT:= λRλt∃e(R(e,t)) **FIRST TRY**

[20] Of course, I am the only responsible for mistakes and errors.

[21] The definition does not follow von Stechow's idea that transformative verbs denote a relation between an event and a property of a state, i.e. something propositional, but it is more Kratzer's, since it assumes these verbs to denote relations between events and individual times. Correctly, Von Stechow argues that we need the property and not the individual state in order to account for the restitutive readings of result state sentences modified by expressions like *again/wieder/di nuovo*. In order to account for these facts we have to assume von

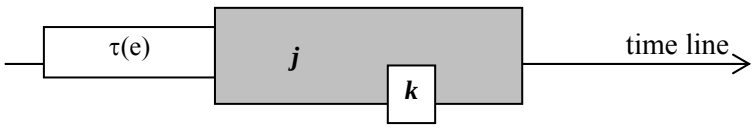
(88) EVENT := λRλe∃t(R(e,t))

According to (88), the eventive aktionsart chooser closes the temporal variable t and gives us a property of events, which can in turn enter the derivation of the LF of an eventive sentence. On the other hand, according to (87), the RESULT aktionsart chooser closes the event variable e and gives us a property of times which are in a complex relation with e. The result state predicate obtained by applying (87) to (85) is represented below

(89) λt∃e(t><τ(e)&CAUSE(e,the-gates-be-open(t))& Agent(e,The-P-D-Studios))

Unfortunately, (89) does not meet the predicate restrictions associated to the tempora infecta since it is not temporally homogeneous. Its non-homogenous nature depends on the "t><τ(e)" condition; as we can see from the picture below, it is not true that every subinterval *k* of an interval *j* abutting the temporal trace of e abuts the temporal trace of e

(90)



This would prevent a result state predicate from combining with a Tempus Infectum. In order to cope with this problem I assume the right definition of the result operator to be the following

(91) RESULT := λRλt∃e∃I(R(e, I) & t ⊆ I) **OFFICIAL**

According to (91), the result operator is a stativizer and its application to (85) gives us the correct definition of the result state predicate below

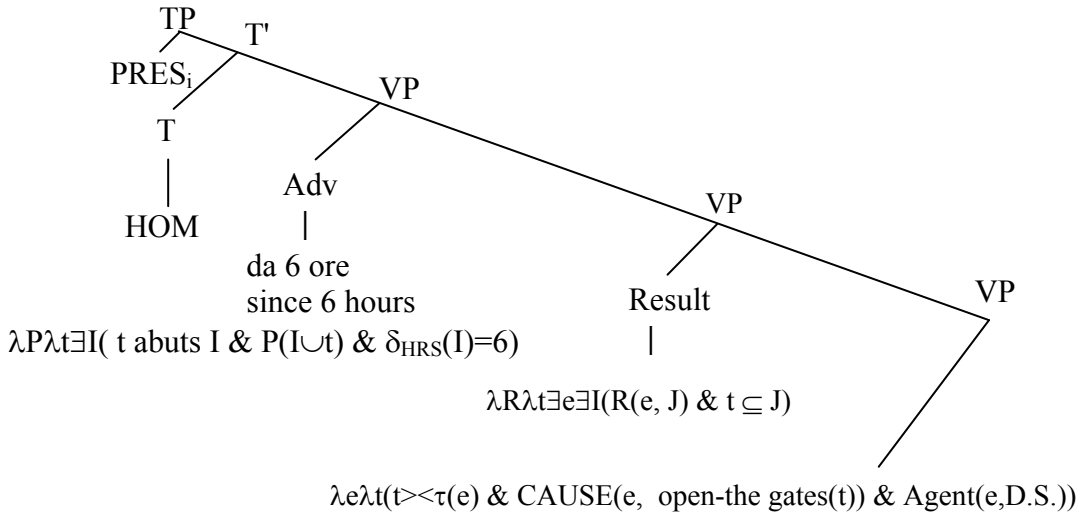
(92) λt∃e∃I (I ><τ(e) & CAUSE(e, the-gates-be-open(I)) & Agent(e,The-P-D-Studios) & t ⊆ I)

This temporal property is homogeneous and meets the homogeneity condition associated by a

Stechow's original formulation of transformative verbs where the first argument of CAUSE is an event and the

da-adverbial, as observed by von Stechow, and the presuppositions introduced by the predicate restrictions associated with the Tempora Infecta. The correct LF for (75) will be therefore

(93)



namely,

(94) ∃I(PRES$_i$ abuts I & ∃e∃J (J><τ(e) & CAUSE(e, the-gates-be-open(J)) & Agent(e,The-P-D-Studios) & (I∪ PRES$_i$)⊆J & δ_{HRS}(I)=6)

Given the LF in (93)-(94), there is one more thing to be explained. According to what (75) says, the 6-hours long interval introduced by the *sinceD*-adverbial is understood as left abutting the temporal trace of the opening event and right abutting the speech time. This does not follow from the application of the *sinceD*-adverbial in (94)-(93). I argue that this left abutting effect is due to pragmatic factors. Since *sinceD*-adverbials sentences are upward entailing (*Mario e` malato da due ore* (Mario is sick since two hours) entails *Mario e` malato da un'ora* (Mario is sick since one hour)), in order to be maximally informative, the length indicated by the *sinceD*-adverbial should be the length of the maximal interval for which we have evidence that the predicate is true. This explains the left abutting effect of *sinceD*-adverbial modification of result state predicates. Under such an analysis the Romance Perfect morphology will therefore be ambiguous being the spell-out of a special tense selecting for temporally homogeneous predicates and the spell-out and of the result state construction as I argued in this section.

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second a temporally specified proposition, namely a set of possible worlds.

2.5 Tense selection and habitual meanings

In section 2.1 I presented some facts concerning habitual meanings and tense selection I want to account for in the system I am proposing.[22] Let me summarize them. In Romance languages, eventive-ongoing and habitual interpretations are generally conveyed by the use of the same tense morphology, as shown by the Italian sentences below

(95) Gianni lavora in giardino

Gianni work-PRES in the garden
LIT: a) John is working in the garden
b) John works in the garden

(96) Gianni lavorava in giardino

Gianni work-PASTimp in the garden
LIT: a) John was working in the garden
b) John used to work in the garden

As we observed in section 2.1, while a sentence with past imperfective verb morphology is ambiguous between an ongoing and a habitual interpretation, a sentence with past perfective verb morphology is generally not, as shown by the sentence below (again)

(97) Gianni lavorò in giardino

Gianni work-PASTperf in the garden
LIT: John worked in the garden

Bonomi (1997)[23] has interestingly proposed that different aspectual verb forms are associated with different structures of quantification in Italian and that these are responsible for the aspectual contrasts between (95)/(96) and (97). According to Bonomi, while the imperfective morphology is the spell-out of an imperfective operator introducing universal quantification over times which is responsible for both a progressive and a habitual reading of an event sentence, the perfective morphology is the spell-out of a perfective operator introducing existential quantification over times which is responsible for the terminative

[22] The habitual interpretation is often seen as a subtype of the imperfective (Comrie (1976) and Bertinetto (1986)).
[23] See also Bonomi (1995) and Bonomi's (in progress). "Semantical remarks on the progressive readings of the imperfective" .

reading of an event sentence. In order to understand the main idea of this interesting proposal we have to look more closer at some of its details.

Bonomi's work is mainly concerned with *when*-constructions like

(98) Quando aveva mal di testa Gianni lavorava in giardino

When he have-PASTimp eache of head Gianni work-PASTimp in garden

LIT: a) Whenever he had a headache, Gianni used to work in the garden

b) When he had a headache, Gianni was working in the garden

(99) Quando ebbe mal di testa Gianni lavorò in giardino

When he have-PASTperf eache of head Gianni work-PASTperf in garden

LIT: When he had a headache, Gianni worked in the garden

Sentence (98) is ambiguous between a progressive and a habitual reading as we can see from the possible translations I have given; sentence (99) is not ambiguous; it only has an eventive perfective reading. In order to explain these facts, Bonomi proposes that sentence (98) and (99) are to be analysed as conveying structures of quantification in which the material from the temporal adjunct clause fills the quantifier restriction while the material from the main clause fills its nuclear scope. In order to formally develop this intuition, Bonomi assumes[24] that in Italian *when*-sentences the temporal subordinating conjunction *quando* (*when*) denotes a function taking two properties of eventualities A, B and giving a relation between a property of eventualities satisfying A and a set of properties of eventualities C such that every eventuality *e'* satisfying C satisfies also B and temporally coincides with *e*. The formal definition for *quando* is given below

(100) *quando*[A,B] = $\lambda e \lambda C$ [A(*e*) & $\forall e'$[C(*e'*) $\leftrightarrow$ B(*e'*) & *e'* temp. coincides with *e*]]

In order to obtain the desired LFs for (98) and (99), Bonomi argues that we first apply the *when*-operator to the eventualities properties denoted by the matrix and embedded VP, represented below

(101) λe(He-have-headache(e))

(102) λe(Mario-work-in-the-garden(e))

[24] I give a slightly different formalization of Bonomi's proposal.

to obtain the following relation between a property of eventualities satisfying (101) and a set of properties of eventualities satisfying (102)

(103) $\lambda e \lambda C$ [He_i-have-headache (e) & $\forall e'[C(e') \leftrightarrow Mario_i$-work-in-the-garden ($e'$) & e' temp. coincides with e]].

Successively, we saturate this relation by application of the *aspectual* operators which are responsible for the different structure of quantification associated with (98) and (99). The definition of the aspectual operators is given below, where *Cont* is the phonetically empty predicate of being contextually relevant

(104) IPF = $\lambda R \lambda i \forall e[e \subseteq i$ & Cont(e) & $\exists C[R(e, C)] \rightarrow \exists C[R(e, C)$ & $\exists e'C(e')]]$

(105) PF = $\lambda R \lambda i \exists e[e \subseteq i$ & $\exists C[R(e, C)$ & $\exists e'C(e')]]$

The application of (104) and (105) to (103) will give the following temporal predicates

(106) IPF(103) = $\lambda i \forall e[e \subseteq i$ & Cont(e) & $\exists C[He_i$-have-headache (e) & $\forall e'[C(e') \leftrightarrow Mario_i$-work-in-the-garden ($e'$) & e' temp. coincides with e]] $\rightarrow \exists C[He_i$-have-headache ($e$) & $\forall e'[C(e') \leftrightarrow Mario_i$-work-in-the-garden ($e'$) & e' temp. coincides with e & $\exists e'C(e')]]]$

(107) PF(103) = $\lambda i \exists e[e \subseteq i$ & $\exists C[He_i$-have-headache (e) & $\forall e'[C(e') \leftrightarrow Mario_i$-work-in-the-garden ($e'$) & e' temp. coincides with e] & $\exists e'C(e')]]$

which, are logically equivalent to

(108) IPF(103) = $\lambda i \forall e[e \subseteq i$ & Cont(e) & He_i-have-headache(e) $\rightarrow \exists e'[Mario_i$-work-in-the-garden ($e'$) & e' temp. coincides with e]]

(109) PF(103) = $\lambda i \exists e[e \subseteq i$ & [He_i-have-headache(e) & $\exists e'[Mario_i$-work-in-the-garden (e') & e' temp. coincides with e]]

These properties are in turn selected by tense in order to derive the following LFs for (98) and (99), where t* is the distinguished temporal variable denoting the speech time

(110) PAST[IPF(103)] = $\exists i \forall e[i<t^* \ \& \ e \subseteq i \ \& \text{Cont}(e) \ \& \ \text{He}_i\text{-have-headache}(e) \rightarrow \exists e'[\text{Mario}_i\text{-work-in-the-garden}(e') \ \& \ e' \text{ temp. coincides with } e]]$

(111) PAST[PF(103)] = $\exists i \exists e[i<t^* \ \& \ e \subseteq i \ \& \ [\text{He}_i\text{-have-headache}(e) \ \& \ \exists e'[\text{Mario}_i\text{-work-in-the-garden}(e') \ \& \ e' \text{ temp. coincides with } e]]$

According to what (110) says, there is a past interval *i* such that for every relevant event *e* included in *i* of *Mario having a headache*, there is an event *e'* of *Mario working in the garden* which temporally coincides with *e*. On the other hand, according to what (111) says, there is a past interval *i* such that there is an event *e* included in *i* of *Mario having a headache* and there is an event *e'* of *Mario working in the garden* which temporally coincides with *e*. Bonomi argues that the imperfective morphology in (98) and the perfective in (99) mark the presence of the two phonetically unrealised operators via a not well specified agreement mechanism. However, if the past imperfective morphology in (98) is the mark of the presence of the IPF operator, what should it mark in simple sentences like (96) and (97), where we find no temporal adjunct clause (thus no complex relation to be selected by IPF)? One way to account for this fact is to assume that even for simple matrix clauses we find silent restrictions and covert *when* operators and therefore that in simple matrix clauses the aspectual morphology is the mark of the presence of the aspectual operators defined in (104) and (105). One problem for this analysis is the complexity of the LF of simple sentences and the unwelcome proliferation of hidden logical structures. However, while discussing the ambiguity of sentences like (112), Bonomi's proposes a more elegant solution to the problem.

(112) Quando giocava a golf, Leo guadagnava molto

When he play-PASTimp at golf, Leo earn-PASTimp much

LIT? : When he played golf, Leo made a lot of money

This sentence is ambiguous between two readings. It means that:

a) in the past, every relevant event of *Leo's playing golf* is temporally coincides with an event of *Leo's making money*;

or that

b) in the past Leo used to make a lot of money (as a lawyer for instance) and used to play golf.

As Bonomi notices, while the rules given in (100) and (104) account for the a) reading, they cannot account for the b) reading since in this case (112) does not mean that there is a temporal coincidence (having certain properties) between *Leo's playing golf* events and *Leo's making money* events, but rather that the two habits of *Leo's playing golf* events and *Leo's making money* overlap in the past. In order to account for these facts, Bonomi modifies his proposal in the following way. He assumes that a covert operator shifts the type of an event predicate into an expression which has the right type for being modified by the IPF operator and that the *when* operator applies to the temporal properties obtained via aspectual operator after type shifting. The definition of the covert operator "↑" shifting the type of an event predicate is the following

(113) $\| \uparrow \| = \lambda P \lambda i \lambda C \forall e' [C(e') \leftrightarrow P(e') \ \& \ i$ temp. coincides with $e']$

Its application to the event predicates λe(Leo-make-money(*e*)) and λe(Leo-play-golf (*e*)) will give

(114) $\lambda i \lambda C \forall e [C(e) \leftrightarrow$ Leo-make-money $(e) \ \& \ i$ temp. coincides with $e]$

(115) $\lambda i \lambda C \forall e [C(e) \leftrightarrow$ Leo-play-golf $(e) \ \& \ i$ temp. coincides with $e]$

In order to apply obtain the correct LF for (112) the IPF is applied to both (114) and (115) to obtain the following temporal properties

(116) $\lambda i \forall i^i [i^i \subseteq i \ \& Cont(i^i) \rightarrow \exists e'$(Leo-make-money($e'$) & i temp. coinc. with $e']$

(117) $\lambda i \forall i^i [i^i \subseteq i \ \& Cont(i^i) \rightarrow \exists e'$(Leo-play-golf.($e'$) & i temp. coincides with $e']$

These temporal properties will be in turn selected by the *when* operator

(118) *when* ((116) , (117))

and this will give us the following relation between a time property and a set of time properties

(119) $\lambda i \lambda C[\forall i' [\, i' \subseteq i \,\&\text{Cont}(i') \rightarrow \exists e(\text{Leo-play-golf.}(e) \,\&\, i' \text{ temp. coincides with } e)] \,\&$
$\forall i'[C(i') \leftrightarrow \forall i''[\, i'' \subseteq i' \,\&\, \text{Cont}(i^{i}) \rightarrow \exists e[\text{Leo-make-money}(e) \,\&\, i'' \text{ temp. coincides with } e]] \,\&\, i \text{ temp. coincides with } i']]$

According to (119) we have the overlapping of the two habits in the interval *i*. At this point, Bonomi applies the tense rule, without caring too much that (119) has not the right logical type for being the complement of tense.

This type shifting strategy lets us account for (95), (96) and (97) without assuming hidden *when*-clauses. For instance, in order to obtain the LF for (96), the application of (113) to the event predicate λe(Mario-work-in-the-garden(e)) will give us

(120) $\lambda i \lambda C \forall e[C(e) \leftrightarrow$ Mario-work-in-the-garden (e) & i temp. coincides with e]

This can in turn be modified by the IPF operator to obtain (assuming that *i, e* and *t* type variables belong to the same logical type) the predicate below

(121) $\lambda i \forall i^{i}[i^{i} \subseteq i \,\&\text{Cont}(i^{i}) \rightarrow \exists e'$(M.-work-in-the-g.($e'$) & i temp. coincides with e']

which gives us the truth conditions for the bare habitual sentence (96) after tense modification.

The most original and interesting point in Bonomi's work is the pursuit of a unified account for both the progressive and the habitual reading of sentences like (96) and (98). According to Bonomi, these readings are obtained from the same LF:

(122) <u>IPF Unifying Principle</u>:
The progressive reading of the imperfective and the habitual reading originate from the *same* logical form, based on universal quantification over eventualities.

Consider again (96) and its LF, as repeated here, to see how the claim in (122) is to be understood

(123) Gianni lavorava in giardino
Gianni work-PASTimp in the garden
LIT: a) Gianni was working in the garden

b) Gianni used to work in the garden

LF: $\exists i \forall i^i [i<t^* \ \& \ i^i \subseteq i \ \& \ \text{Cont}(i^i) \rightarrow \exists e'(\text{G.-work-in-g.}(e') \ \& \ i \ \text{ t.c.w. } e']$

According to Bonomi, pragmatic factors will determine when (123) has a progressive reading instead of a habitual one. When *i* is to be considered one of the intervals mentioned in the restrictor (namely *i'*), the progressive reading is available, because what (123) says is that the whole interval *i* itself is occupied by an event of *Gianni's working in the garden*; in other words such an event is going on at *i*. To be noticed is that the context plays a crucial role in determining whether *i* itself is relevant.[25]

Apart from the problems concerning type coherence, since events properties and temporal properties are assumed to belong to the same logical type, there are some facts making Bonomi's proposal not entirely convincing[26]. The first concerns the role of the contextual restriction predicate *Cont* and the events characterizing every contextually salient interval i^i in the LF of sentences like (123). Consider again sentence (123) and its LF as repeated below

(124) Gianni lavorava in giardino
Gianni work-PASTimp in the garden

LF: $\exists i \forall i^i [i<t^* \ \& \ i^i \subseteq i \ \& \ \text{Cont}(i^i) \rightarrow \exists e'(\text{G.-work-in-g.}(e') \ \& \ i \ \text{ t.c.w. } e']$

In the case in which there is exactly one contextually relevant interval i^i properly included in *i*, the LF above does not represent the truth conditions of the habitual reading of (124); in order to represent the habitual reading of (124) we need say that there is a sufficient large number of actual events happening in *i* and moreover that these events distribute uniformly throughout *i* (we need a partition of *i*). The LF above does not guarantee these conditions.

A second problem concerns the empirical predictions of Bonomi's proposal. In Bonomi's analysis, the "Imperfetto" morphology is the mark of the presence of the IPF operator which is responsible for both the progressive and the habitual readings. However, habitual readings are <u>always</u> conveyed by morphological perfective sentences when a durative *for* adverbial measures the time span of the habit in Italian; consider the facts we presented at the beginning of this chapter represented below again

[25] I freely quoted from Bonomi, A. (in progress). "Semantical remarks on the progressive readings of the imperfective.".
[26] Additionally there is the not convincing fact that Bonomi's analysis requires a very complex analysis of simple present tense matrix sentences.

(125) Leo prendeva il te` alle cinque

Leo take-PASTimp tea at five
LIT: Leo used to drink tea at five

(126) ?? Leo prendeva il te` alle cinque per venti anni
Leo take-PASTimp tea at five for twenty years

(127) Leo ha preso il te` alle cinque per venti anni [Present Perfect]
Leo have-PRES take-PASTpart tea at five for twenty years

(128) Leo prese il te` alle cinque per venti anni
Leo take-PASTperf tea at five for twenty years

As we can see from this contrast, when a durative adverbial measures the time span of the habit, habitual interpretations are conveyed by the use of the Passato Remoto (Past Perfective) or the Passato Prossimo (Present Perfect) and the Imperfetto is bad. These important facts are a problem for Bonomi's proposal, and they have always been disregarded in the literature about habituality and aspect in Italian since in all these analyses the imperfect morphology is seen as the spell-out of a semantic operator responsible for the habitual reading. (see for example Bertinetto (1986) and Lenci & Bertinetto (2000)). The data in (125)-(128) show that this view is not empirically correct.

As we said, it is however not true that *for*-adverbials never combine with the tempora infecta (present and past imperfective). In fact they combine when the sentence gets a habitual interpretation, as repeated below

(129) Il venerdì Carlo correva nel parco per due ore

The Friday Carlo ran-PASTimperfective in the park for two hours
Lit: Fridays Carlo used to run in the park for two hours

(130) Il venerdì Carlo corre nel parco per due ore

Fridays Carlo runs-PRES in the park for two hours

These facts follow straightforwardly from an integration of Scheiner's (2002) convincing analysis of habitual sentences in the system I am proposing. According to Scheiner, who

develops an intuition found in von Stechow and Paslawska (2000), habitual meanings are obtained by means of a covert extensional habitual operator which stativizes its complement.[27] Her definition of the habitual operator is the following

(131) HAB:= λQλPλI∃J[I⊆J & (Q(P))(J)],
where I and J are intervals and Q a quantifier.

According to (131), HAB denotes a relation between a set of quantifiers, a set of temporal properties and a set of times such that these times are included in the interval including the many-quantifier defined times of which the temporal property is true. An example of quantifier is given below

(132) ∃-many := λPλt[|t' : t' ⊆ t & P(t') | > C] where C is a context dependent number of t' for which P(t')

Let us consider (129) as repeated below and see how Scheiner's proposal works.

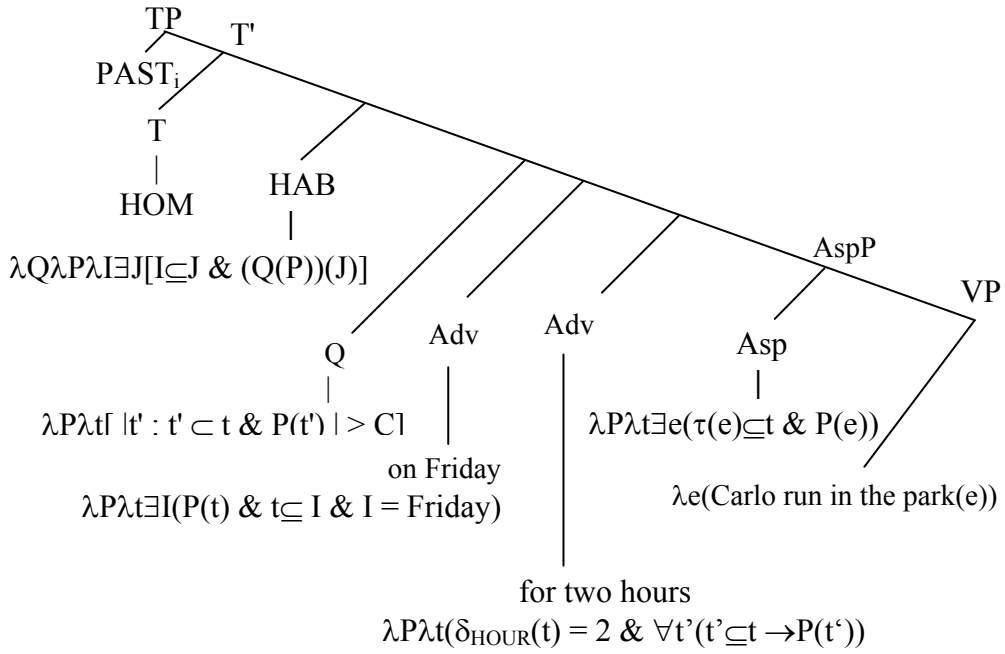
(133) Il venerdì Carlo correva nel parco per due ore

On Friday Carlo ran-PASTimperfective in the park for two hours
Lit: On Friday Carlo used to run in the park for two hours

The correct LF for (129), according to the temporal architecture I am assuming will therefore be

[27] That this operator should be an extensional operator, contrary to what Lenci & Bertinetto claim, is easy to see. For (129) to be true there should be a habit of Carlo's which is based on actual *Friday Carlo's running in the park* past events. If Carlo had never run in the park on Friday in the actual world, (129) would have been false. This distinguishes habitual sentences from generic or dispositional ones. Consider, for instance, the dispositional sentence "John sells used cars". This sentence can be true even if John never sold a used car in his life.

(134)



(135) ∃t[PAST$_i$ ⊆ t & [|t' : t' ⊆ t & ∃I(∃e(δ$_{HOUR}$(t') = 2 & ∀t'' (t'' ⊆ t' → t''⊆τ(e) & Carlo run in the park (e))& t'⊆ I & I = Friday) | > C]]

The formula in (135) says that a contextually given past time is included in a time at which Carlo has the habit of *running for two hours on Friday*. The LF for (130) will be analogous with the difference that the temporal pronoun in SpecTP is PRES$_i$.

As you can see from (131), and in (134)-(135), the habitual operator gives an homogeneous temporal property. That this is intuitively correct is pretty clear: if it is true that last year I had the habit of running in the park on Fridays, it is true I had this habit in every month of last year, in every week of last year, in everyday, and so on. This explains why habitual readings are generally conveyed by the use of a tempus infectum which requires its complement to be homogeneous. Thus, this also explains while *for*-adverbials combine with the tempora infecta under a habitual reading: the habitual operator homogeneizes the non homogeneous temporal property obtained by *for*-adverbials modification.

As we saw in (126)-(128), when a durative adverbial measures the time span at which the habit holds in the past, habitual interpretations are conveyed by the use of the Passato Remoto (Past Perfective) or the Passato Prossimo (Present Perfect) and the Imperfetto is bad. These facts follow straightforwardly from our analysis. According to what these sentences say, the adverbial does not measure the time of each *Leo's having tea at five* event, this is

pragmatically ruled out by the fact that *tea drinking* events usually do not take 20 years. It rather measures the whole interval at which Leo had the habit of *having tea at five*. In Order to obtain this reading, the durative adverbial has scope over the habitual operator. In this case, the obtained temporal property, i.e. the property of being a twenty-year long interval at which Leo has the habit of having the tea at five, is quantized and therefore it cannot combine with a tempus infectum, but it does with a tempus perfectum.

Clearly, if the interval at which the habit holds is modified by *sinceD*-adverbials the obtained temporal predicate combines with a tempus infectum but not a tempus perfectum as shown by the sentences below

(136) Leo prendeva il te`alle cinque da venti anni [Imperfetto]
Leo take-PASTimperf tea at five since twenty years

(137) ??Leo prese il te`alle cinque da venti anni [Passato Remoto]
Leo take-PASTperf tea at five since twenty years

To sum up, it is wrong to assume that Italian Imperfetto is the spell out of a habitual operator. The Italian Imperfetto is on the contrary the spell out of a tense selecting for an homogeneous complement. The property of being a time at which a habit holds is homogeneous, if not modified by a quantizing adverbial; therefore it combines with a tempus infectum but not with a perfectum. When the habit is modified by a quantizing adverbial such as *for twenty years*, the pattern of acceptability changes.

These observations can moreover be extended to generic sentences. In the literature about Italian (see for instance Lenci and Bertinetto (2000)) it is claimed that generic meanings are always conveyed by the use of the Presente, or the Imperfetto. Once again, this is not correct if we consider sentences like

(138) Il Neanderthale è stato vegetariano per 30.000 anni. Poi è diventato onnivoro
The Neanderthaler has been a vegetarian for 30.000 years. Then he became an ommnivor

The reading here is clearly a generic one but the tense morphology is perfective. According to the proposal I am making, the tense morphology in (138) is dependent on the occurrence of the *for-adverbial* which quantizes the generic temporal proposition to be true of a 30.000 years long interval.

2.6 Conclusions

In this chapter I have shown that *temporal homogeneity* plays a fundamental role in the selection of tense in Romance Languages. I proposed a tense decomposition in which tense is sensitive to the temporal homogeneity of its complement. This accounts for the fact that while temporal adverbials which homogenize the temporal property they modify combine with the morphological imperfective tenses, which I called Tempora Infecta, temporal adverbials which quantize the temporal property they modify combine with the morphological perfective tenses, which I called Tempora Perfecta. We have seen that this decomposition explains the fact that perfective readings of event predicates are usually conveyed by the use of a tempus perfectum, while imperfective readings by the use of a tempus infectum. Usually, as I said, but not always. In fact, when a temporal adverbial intervenes above the aspectual projection the pattern of combination changes. This follows from the fact that, in my proposal, the tense morphology is not the spell-out of the combination of a tense and of an aspectual operator but rather the spell-out of semantic tenses which have some influence in the aspectual interpretation of a sentence. Moreover, we have seen that habitual interpretations are conveyed by the use of a Tempus Infectum or of a Tempus Perfectum depending on weather the habit is or is not quantized by a durative temporal adverbial. I have argued that this also accounts for tense selection in generic sentences. I have proposed an analysis of the Perfect in Romance languages which assumes that perfect constructions are ambiguous between a past/priorean reading and a result state one depending on the class of the predicate occurring in the VP. We have seen how temporal homogeneity plays an important role in Perfect constructions. In the next chapter I will explore a cross-linguistic extension of the homogeneity proposal by looking at English temporal phenomena.

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3 CROSS-LINGUISTIC COMPARISON

In this chapter we will briefly explore a cross-linguistic generalization of the homogeneity proposal by looking at some English facts mentioned in chapter 1. Our discussion will be mainly focused on habitual and ongoing interpretations. Concerning the latter, we will discuss some of the analysis of English progressive sentences and we will explain why progressive constructions are not used cross-linguistically to convey habitual meaning but present tense sentences can be. The discussion will suggest a redefinition of the Romance IPV operator. We will moreover see the factors that make present tense sentences ambiguous between a habitual and an ongoing reading in Romance languages but not in English.

3.1 English facts

In chapter 1, we mentioned that event predicates are generally bad when appearing in the present tense, unless the sentence is interpreted habitually or, more marginally, is interpreted as conveying a strongly marked "reading of reports". Consider the following present tense event sentence

(1) At five o'clock, Peter drinks a beer

Sentence (1) is generally interpreted as *Peter has the habit of drinking a beer at five o'clock*. According to its more marginal "reading of reports", sentence (1) has a perfective/terminative interpretation and it means that there is an event of *Peter drinking a beer* which is accomplished right now, five o'clock. If on the one hand, sentence (1) can also have a perfective/terminative interpretation, although marginally, on the other hand, it cannot have an imperfective/ongoing interpretation; namely it cannot be used to convey a present ongoing event of *Peter drinking a beer*. In order to convey an ongoing reading, the sentence should appear in the progressive, as shown by the sentence below

(2) At five o'clock, Peter is drinking a beer

In this chapter I will argue that these facts follow from the extension of our analysis of tense and aspect in Romance languages to English.

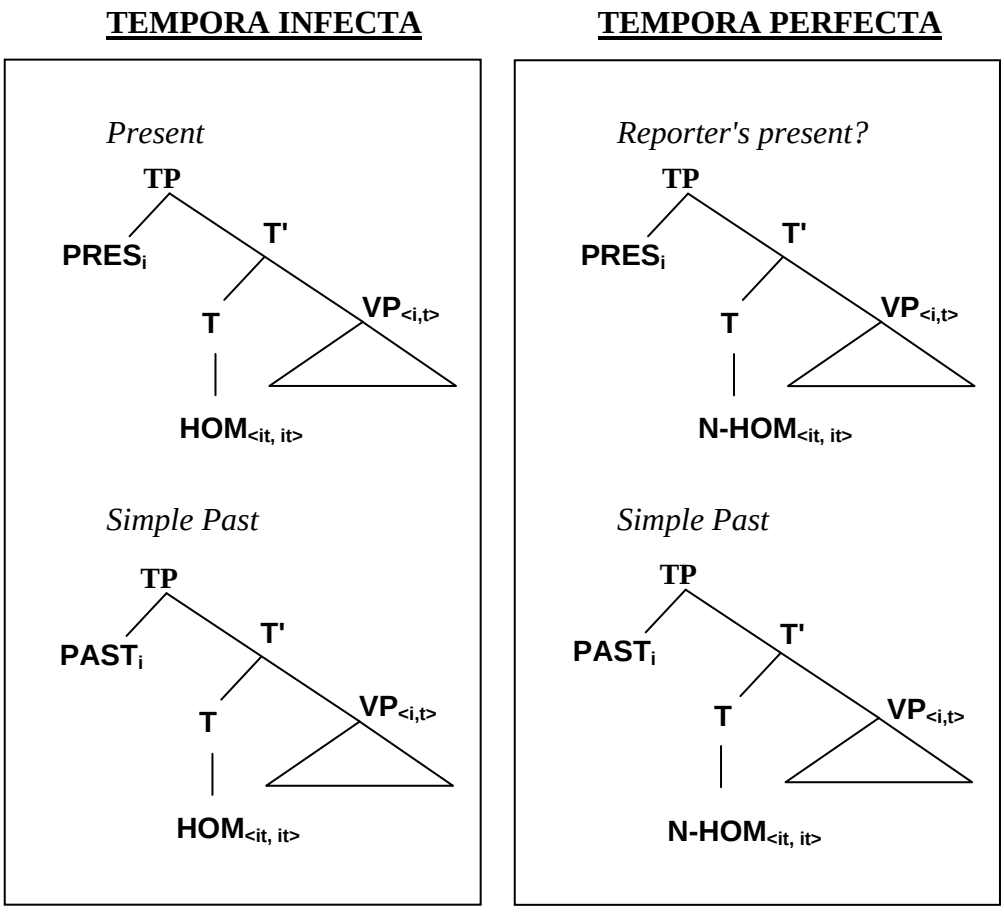
The proposal in short

In order to account for the facts above I will assume that:

- The tense architecture of English is analogous to the one of the Romance languages.
- English has two lexical entries in its inventory of tenses: a tempus perfectum combining with temporally non-homogeneous predicates and a tempus infectum combining with a temporally homogeneous predicate.
- English progressive forms are the morphological spell-out of a *modalized* $IPV_{<et,it>}$ aspectual operator and we find no covert IPV operator in English.

3.2 Tense and aspect in English

Given the assumptions above, the English tense architecture will be the one represented in the tables below



According to this classification, while the English present tense is a tempus infectum combining with a temporally homogeneous predicate, the reporter's present is a tempus perfectum combining with a temporally non-homogeneous predicate, exactly like in Romance languages. Given this assumption, the English facts in (1) and (2) will be explained in the following way: since the present tense selects for homogeneous predicates and the IPV operator is morphologically overt while the PVF operator is covert in English, event predicates in the present tense morphology will be interpreted habitually, according to the analysis we gave in section 2.5, or in the marginal "reading of reports". That event predicates in the present tense cannot have an ongoing interpretation is explained by the fact that the IPV operator is responsible for the ongoing reading of event predicates and the IPV operator is always spelled out by the progressive morphology. In chapter 2, we defined IPV as an extensional operator from properties of events into properties of times included in the temporal trace of the particular event. At this point, if we want a unified treatment of ongoing reading of event predicates for both Romance languages and English, we have to compare the meaning of English progressive forms to ongoing interpretations conveyed by Romance tempora infecta. This will be done in the next section.

Concerning the past tenses, the simple past morphology is ambiguous between being the spell-out of a tempus infectum and a tempus perfectum, according to the classification given above. This entails that an event predicate will combine with past perfectum when it is interpreted terminatively, while it will combine with the infectum past under an ongoing interpretation which requires the presence of the progressive morphology.

3.2.1 Progressive forms

It is well known that in the literature about the formal characterisation of the English progressive starting from the work of Scott (1970) and Montague (1970) we find two different positions concerning the fact whether the progressive has a modal meaning (Dowty (1979), Landman (1992), Bonomi (1992), (1997)) or not (Bennett & Partee (1972), Taylor (1977) Parsons (1994)). We will not go into the details of this debate. I will only sketch it in order to motivate my belief that the intensional approach is the correct one and to get to an explicit definition of the IPV operator which fits coherently into our system.

According to the original Scott and Montague's truth conditions, a progressive sentence like

(3) Peter is building a house

is true at the instant t iff there is an open interval *i* including t such that

(4) ∃x(house(x) & Peter build(x))

is true at every instant of *i*. It is well known that this analysis entails

(5) Peter is building a house → Peter built a house

This is because, if *i* is an open interval including t such that (4) is true at every instant of *i*, there is a t' included in *i* such that t' is t' < t and (4) is true at t'. According to our intuitions (5) should not be valid, since, if Peter is building a house right now, it is not true now that he has already built this house. In order to avoid this problem, Bennet & Partee (1972) propose that in the truth conditions of progressive sentences the untensed part of the sentence is to be evaluated with respect to a big interval containing the original evaluation time. According to this analysis, the progressive form is the spell-out of a propositional operator as defined below

(6) PROGα is true at the interval *i* iff *i* is a moment and there is an interval *i'* such that *i'* ⊇ *i* and *i* is neither the final subinterval nor the initial subinterval of *i'* and α is true at *i'*.

Given the definition in (6), sentence (3) will therefore be associated with the following LF

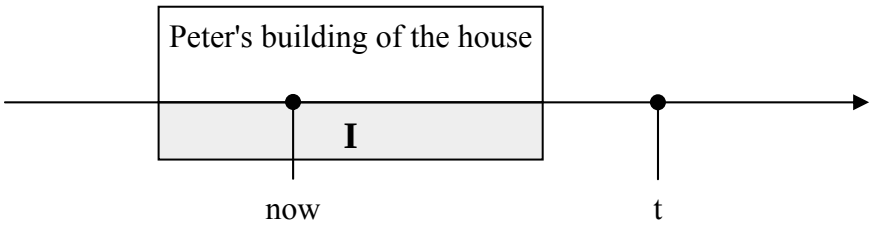
(7) PROG∃x(house(x) & Peter build(x))

and it will be true at *i* iff there is an interval *I* including *i* at which

(8) ∃x(house(x) & Peter build(x))

is true. According to these truth conditions, (5) is no more valid. However, this analysis makes a false prediction, as the authors recognise in a later postscript to their paper. The problem is the following; given the definition of PROG in (6), the sentence *Peter is building a house* entails *Peter will have built a house*. This is because: (a) *Peter is building a house* is true now iff there is a interval I including now at which *Peter build a house* is true; (b) if there

is this interval I including now at which *Peter build a house* is true, then there is a time t after now at which *Peter built a house* is true, since this interval I will be before that future time t, as shown in the picture below



As Dowty (1979) observes, there are cases in which the larger interval does not exist in the actual world, as shown by the sentence below

(9) John was building a house when he died.

If (9) is true now, there will never be a interval *I* containing now at which John accomplished the building of his house. This is because unfortunately John will never manage to build his house according to what (9) says. According to Dowty, this is one of the signs that we need an intensional account for the progressive, i.e. a theory in which the ongoing event is completed not necessarily in the actual world but rather in a set of possible worlds having certain properties. Dowty proposes the following definition for the progressive

(10) PROGα is true at the interval *I* in a world *w* iff there is an interval *I'* such that $I \subset I'$ and *I* is not a final subinterval of *I* and α is true at *I'* in every *w'* such that *w'* is an *inertia world* of *w* at *I*.

Following a suggestion from Lewis, Dowty defines the set of the *inertia worlds* of *w* at *I* as the "set of worlds which are exactly like the given world *w* up to *I* and in which the future course of events after this time *I* develops in ways most compatible with the past course of events".[1] In other words, the *inertia worlds* are words in which after *I* nothing unexpected or contrary to the "normal course of events" happens. Given the definition in (10), "Peter is building a house" will no more entail "Peter will have built a house", since "Peter is building a house" is true now iff "Peter build a house" is true at a bigger interval containing now in every inertia worlds and the actual world does not necessary belong to this set of worlds. Consider

[1] Free quoting Dowty (1979), p. 148.

in fact sentence (9). Clearly, a world in which Peter dies while building his house is a world in which something unexpected happens; this world does not belong to the set of the inertia worlds in which *Peter's building a house* is completed.

Parsons (1989; 1990) argues that there is a problem concerned with the reference to a completed event that we find in every intensional analysis of the progressive. The argument that Parsons brings to his point is the following. In Dowty's proposal a sentence like

(11) Peter was building a house

will have the following LF

(12) PAST PROG [Peter build a house]

According to Dowty's definition, in every inertia world there is a completed *house building* event, that is to say, in every inertia world there is a finished house built by Peter. As Parsons says, this can be represented as below, where the existential quantification has scope under the progressive operator

(13) PAST PROG ∃x[x is a house & Peter build x]

A condition for (11) to be true is that in every inertia world there is a house which is brought about by the completion of *Peter's building a house* event. According to Parsons this is a problem since, in this case, (11) will have the same truth conditions as the following sentence

(14) Peter was building a house that he would finish

This is because, being the progressive operator a propositional operator, the relative clause is in the scope of the progressive in (14), as shown below

(15) PAST PROG [Peter build a house [FUT[that he finish]]]

But clearly, (14) says something different from (11). According to what (14) says, Peter finished his house in the actual world. For Parsons this is a clear sign that an intensional account of the progressive in which we make reference to completed events is wrong. In order

to cope with this problem, Parsons proposes an analysis of the progressive in terms of properties of underlying eventualities.

As we have seen in section 1.3.1, Parsons (1989, 1990) proposes a neo-Davidsonian analysis in which state predicates have underlying state variables and event predicates have underlying event variables as shown below

(16) John loves Mary

LF: ∃s[love(s) & Subj(s, Mary) & Theme (s, John)]

(17) Peter buttered the toast

LF. ∃e∃x[butter(e) & Agent(e, Peter) & Theme(e, x) & Toast(x)]

The idea is that event sentences express existential quantification over events while state sentences over states. According to Parsons, one distinction between events and states is that the former can culminate while the latter cannot. Culmination is explained by Parsons in the following way: "if Mary builds a bookcase, then there is a period of time during which the building is going on -the development portion- and then (if she finishes) there is a time at which the bookcase finally gets built, the time of culmination". According to Parsons not every event has a culmination: "if Mary begins building a bookcase but is struck by lightening when she has finished three quarters of the work, then there is an event which is a building, that has her for a subject, that has a bookcase (a unfinished one) as object, and that never culminates". Accomplishments, achievements and processes[2] (Vendler's activities) can culminate, while states cannot: there is no culmination point of a state, a state simply holds or it does not. Parsons introduces at this point two predicates *Cul* and *Hold* defined as follows

(18) *Cul* (*e*, t) = 1 iff the event *e* culminates at time t

(19) *Hold* (*e*, t) = 1 iff the eventuality *e* holds at time t

where "the eventuality *e* holds at time t" means that *e* is either a state or *e* is an event which is in progress (in its development portion). Successively, Parsons introduces some semantic principles which can be formulated as follows

[2] According to Parsons *P* is a predicate of processes iff $P(e) \rightarrow \exists e'(e' \subset e \ \& \ P(e')$ and e' culminates).
The idea is that a process such as *Mary's running* is composed by some culminating *Mary's running* sub-events.

(i) If A is an event verb occurring in a simple non progressive sentence, the logical form of the sentence contains *Cul*

(ii) If A is a state verb occurring in a simple non progressive sentence, the logical form of the sentence will contain *hold*

(iii) If A is an event verb then "be A-ing" is to be treated semantically as a state verb, i.e. the logical form of the sentence in which "be A-ing" occurs will contain *hold*

Given these assumptions, the LF of a simple past event sentence like

(20) Peter built a house

will be

(21) ∃t∃e∃x[t< now & build(e)&Agent(e,Peter) & Theme(e,x) & house(x) & cul(e,t)]

Given Parsons' assumptions, one observation about the truth conditions of a simple past event sentence is that accomplishment predicates in the simple past describe punctual events, like achievement predicates.[3] This is so because the predicate *Cul*(e,t) is true of a point, not of an interval. But, if *Cul*(e,t) is true of a point, the following statements should be natural

(22) ?At five, Peter built a house.
= At five, Peter finished building a house.

(23) ?At five, Peter flew to Boston.
= At 5, Peter terminated his flight to Boston

However, these sentences are quite unnatural and they do not have the readings we gave above according to Parsons` proposal. According to what (22) and (23) say, what is temporal located is not the time of the culmination but rather the time of the entire event. This is a problem for Parsons` analysis of simple past event sentences.

Moreover, given the assumptions in (iii), the LF of a progressive past sentence like

[3] This observation is originally from von Stechow (p.c.).

(24) Peter was building a house

will be

(25) ∃t∃e∃x[t<now &build(e)&Agent(e,Peter) & Theme(e,x) & house(x) & hold(e,t)]

According to (iii), the predicate "be building a house" in (24) is classified as a state and therefore it will require the introduction of the *Hold* predicate in the LF of the sentence. Under this analysis (11) and (14) will not have the same truth conditions; in fact, in the truth conditions of (11) we will not refer to an event which is completed in the set of inertia worlds but rather we will refer to an event which is ongoing in the actual world. On the other hand, (14) says that this event, which was going on at some time in the past, is completed at a later time in the actual world. Clearly, as Parsons points out, this treatment of the progressive solve the problem of the imperfective paradox since, to say that an event holds at a time is not to say that it culminates at that time.[4]

Parsons' criticism of the reference to a completed event in a modal analysis of the progressive does not seem convincing if we consider examples like the following, discussed by Landman (1992) and more recently by Bonomi and Zucchi (2001) (originally from Kvart)

(26) Mary was killing a Roman soldier before she got killed

(27) Mary was wiping out the Roman army before she got killed

Imagine that Mary is a person of moderate physical capacities, that she is fighting against the Roman army and that she manages to kill a couple of soldiers before she gets killed. Sentence (26) is true while (27) is false in this situation. But, as Bonomi & Zucchi (2001) observe, this does not follow in Parsons' analysis. Consider in fact the two (simplified) LFs associated with the two matrix sentences in (26) and (27)

(28) ∃t∃e[t<now & Mary-kill-a-Roman-soldier(e) & hold(e, t)]

(29) ∃t∃e'[t<now & Mary-wipe-out-the-Roman-army(e') & hold(e', t)]

According to the described scenario, we want (28) not to entail (29), i.e., we want the formula

[4] We won't go into the details and the refinements of Parsons' proposal since they are not relevant to our discussion.

"hold(e, t)" not to entail "hold(e', t)". Since in Parsons' system a progressive sentence is true if the described event is not completed, (29) should be true in the situation in which Mary cannot be false only because Mary gets killed before wiping out the Roman army in our scenario. Therefore, given Parsons' analysis, we do not understand why (27) should be false in the described scenario. The reference to a completed *Mary's wiping out the Roman army* event seems in this case necessary for falsifying (27). Bonomi & Zucchi observe that this problem is completely obscured in Parsons' analysis since we do not find an explicit truth condition for the formula "hold(e', t)" and in order to cope with the problem above, an explicit definition of the *hold* predicate needs a "modalized" reference to a complete event.[5]

There are a number of additional problems for Parsons' analysis of the progressive as pointed out by Landman (1992). The most salient concerns creation verbs. As you can see from (25), the truth of (24) commits us to the existence of an actual house, since (25) entails

(30) $\exists x[\text{house}(x)]$

This means that if Peter is building a house now, then there is now an actual house which is caused by *Peter's building* event holding now. This seems intuitively wrong as observed by Landman (1992). If Peter is building a house and he has built only its foundations we do not say that there is already an actual house. Parsons is aware of this fact and interestingly he claims that the inference from (25) to (30) is valid since (25) does indeed commit us with the existence of an actual house, precisely an *incomplete* house. Therefore, if Peter is building a house and he has built only its foundations we are allowed to say that that there is an actual incomplete house. However, Parsons' replay does not seem convincing since, as Landman observes, he discusses cases where the objects are typically created in stages. In these cases, we do not find complete objects in the creation stages, but we find incomplete objects. But what about cases in which objects are not created in stages, cases in which the object comes

[5] The same problem affects Giorgi & Pianesi (2001) recent analysis of Italian imperfective sentences. According to this analysis the LF associated with an Italian imperfective event sentence contains an event variable which can denote non terminated events under an ongoing reading. But non terminated events are under-specified events: the event *Mary's killing a Roman soldier* in our scenario is a non terminated event of *Mary's wiping out the Roman army*. The prediction of Giorgi & Pianesi proposal in our scenario is that the sentence

(i) Maria uccideva un soldato romano
Maria killed-PASTimperfective a soldier Roman
LIT: Mary was killing a Roman soldier

entails the sentence

(ii) Maria annientava le legioni romane
Maria wiped- PASTimperfective the army Roman
LIT: Mary was wiping out the Roman army

into existence “in a flash” at the end of a creation process? Landman discusses this example for illustrating them

(31) God was creating a unicorn when he changed his mind.

Imagine that God was about to bring a unicorn into existence by uttering the magic formula and that he changed his mind whilst doing it. As Landman observes, (31) is true in this scenario. However, in this case, the truth of the progressive sentence does not commit us to the existence of an actual unicorn, neither to the existence of an incomplete one. A modal characterisation of the progressive is therefore required if we want to cope with these problems (for further argumentation for a modal approach to the progressive see also Bonomi (1997) and Asher (1992)).

In order to give a definition of the IPV operator which is sensible to the facts we have discussed so far, I will assume Landman’s analysis of the progressive. According to Landman, we have to modify Dowty's notion of *normality*, which plays a crucial role in the truth conditions of progressive, if we want to account for examples like the following which is true in a scenario first discussed by Vlach (1981)

(32) Mary was crossing the street when the truck hit her

> SCENARIO: Mary is walking to the other side of the street and she does not realise that a truck is coming towards her direction. If nothing unexpected happens, the truck will hit her; it would be a miracle for her to escape.

Dowty's truth conditions of the progressive predict that (32) is false in the described scenario, since the inertia worlds are worlds in which nothing unexpected happens; if *Mary's crossing* and the *truck coming* events follow their natural course, we will have a collision and Mary will never complete her crossing in the set of the inertia worlds.[6] In order to cope with this problem, Landman proposes that while considering the natural continuation of an event stage

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[6] Hinrichs (1983) gives a slightly different but clearer presentation of Vlach's observations

(i) Mary was crossing the street when the truck hit her

Take the instant *t* at which Mary is hit by the truck in the actual world. If (i) is true at *t*, Mary crosses the street at an interval *I* including *t* in every inertia world. But at *t* the inertia worlds are exactly like the actual world; therefore if Mary is hit by the truck at *t* in the actual world, she is hit by the truck at *t* in every inertia world. Therefore (i) should be false according to Dowty's truth conditions.

"we have to abstract away from facts about the world that are external to that stage".[7] According to Landman event stages of an event *e* are parts of *e* which are big enough and share enough with *e* so that we can call them a less developed version of *e*. For Landman, *Being a stage of an event* is therefore different from *being a part of an event* since "we cannot say that when an event stops in a world, there is no bigger event of which it is part in this world, but we can say that there is no bigger event in the world of which it is a stage". Going back to our (32), we have to look at Mary's crossing "solely on the basis of what is internal, inherent to that stage".[8] What is relevant here is whether the stage of Mary's crossing "is the process of which it is normally reasonably within Mary's capacity that she will complete it".[9] This is the reason why (32) is true. Analogously, the fact that (27) is false in its described scenario is explained by the same reasons. If Mary is a person of moderate physical capacities, she doesn't have a chance of wiping out the Roman army. In other words, there is no reasonable chance on the basis of what is internal to the stage of *Mary's wiping out* (the killing of a couple of soldiers) that it will continue and complete. In order to develop this intuition, Landman assumes the progressive to be a relation between an event *e* and an event type *V*, such that

(33) PROG(*e*, *V*) is true in a world w iff in some world in the continuation branch of *e* in w some event realises the event type *V*.

where *the continuation branch of e in w* (henceforth C(*e,* w)) is a set of pairs of events and worlds.[10] The idea of continuation branch *e* in w is that you follow the development of *e* in the actual world w; If *e* stops in w, then we follow it in the closest world w' where it does not stop, if w' is a reasonable option for *e* in w.[11]

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[7] Landman (1992): p.25.
[8] Landman (1992): p.25.
[9] Landman (1992): p.25.
[10] "The *continuation branch* for e in w is the smallest set of pairs of events and worlds such that

1. For every event *f* in w such that *e* is a stage of *f*, <*f*,w>∈C(*e*,w); the continuation stretch of *e* in w;
2. if the continuation stretch of *e* in w stops in w, it has a maximal element *f* and *f* stops in w. Consider the closest world *v* where *f* does not stop:
   - if *v* is not in R(e, w), the continuation branch stops.
   - if *v* is in R(e, w), then <*f, v*> ∈ C(*e,* w). In this case we repeat the construction:
3. for every *g* in *v* such that *f* is a stage of *g*, <*g, v*> ∈ C(*e,* w), the continuation stretch of *e* in *v*.
4. if the continuation stretch of *e* in *v* stops, we look at the closest world *z* where its maximal element *g* does not stop:
   - if *z* is not in R(e, w), the continuation branch stops.
   - if *z* is in R(e, w), then <*g, z*> ∈ C(*e,* w) and we continue as above" (Landman, 1992: p. 26).

[11] It is important to notice that Landman's proposal presents some of the difficulties we encountered while

We can at this point implement Landman's analysis in our system. As I said before I will assume the progressive to be an aspectual operator taking an event predicate as argument, introducing a relation between an event and an event predicate in Landman's style and giving a temporal predicate as value, as defined below

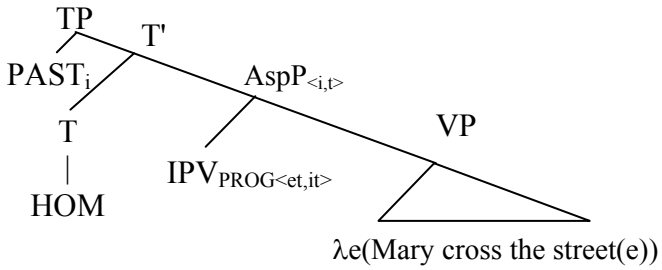
(34) IPV_{PROG}:= λPλt∃e[t ⊂ τ(e) & ∃w'∃e'[<e', w'> ∈ continuation branch of <e, w*> & P(e')]]

The LF of the sentence

(35) Mary was crossing the street

will therefore be

(36)



Clearly, the definition in (34) predicts that the progressive morphology appears with state predicates, since a state predicate denotes a time property and the progressive morphology is the spell-out of the IPV_{PROG} operator whose argument are event properties.

3.2.2 Going back to Romance Languages

In chapter 2, we assumed that ongoing readings of event predicates are obtained by the covert occurrence of the IPV aspectual operator in Romance languages. We defined this operator as a simple estentional operator as below

discussing G&P proposal. Consider in fact sentence (32) again. Perhaps a particular event e' is a stage of a crossing the street event, but how do we know? Intuitively, we know that only if we know Mary's intention.

(37) $||IPV|| = \lambda P \lambda t \exists e(\tau(e) \supset t \ \& \ P(e))$

If we consider the following data in the light of the analysis of English progressive sentences we realize that this definition is not entirely correct. Consider the following Italian sentence

(38) Mario faceva una torta

Mario make-PAST.IMP.3sing a cake
LIT Mario was baking a cake

According to the analysis we gave in chapter 2, sentence (38) is true iff there is a past interval which is included in the temporal trace of the *Mario baking a cake* event. These truth conditions are obtained according to (37), but notice that in (37) we refer to actual events and therefore to actual temporal traces of actual events. Therefore, it is implicitly assumed that there will always be a bigger actual interval containing the temporal trace of the actual event; in other words, the assumption of (37) leads us to the same problem we encountered in Partee and Bennett`s analysis of the English progressive, since (38) will entail

(39) Mario avrà fatto una torta

Mario will have baked a cake

namely, that there is a time in the future at which Mario will have baked the cake. This inference is clearly not correct if we consider a sentence analogous to the English ones we have discussed so far like the one below

(40) Mario_i morì la notte di natale mentre (pro_i) faceva una torta

Mario died on the Christmas night while he was baking a cake

According to what (40) says, Mario did not complete his masterpiece; notice that this is the very same phenomenon we found while discussing the English progressive sentence (9). These facts show that a simple extensional analysis of ongoing readings of event predicates conveyed by the use of the *Imperfetto* is not enough.

Interestingly, the temporal meaning expressed by (38) is conveyed in free variation by a progressive construction in Italian, as shown by the sentence below

(41) Mario stava facendo una torta

Mario was-PAST.IMP.3sing making a cake
LIT: Mario was baking a cake

Sentence (38) and (41) are perfectly synonymous.

In order to account for these facts I will assume that the ongoing readings associated with (38) and (41) are conveyed by means of the same semantic IPV_{PROG} operator we assumed to be responsible for ongoing readings of event predicates in English, as defined in (34). In order to explain the morphological variation between (38) and (41), I will assume that while in (41) the IPV_{PROG} operator is morphologically realized by the progressive construction, in the case of English, it occurs covertly, as in (38). It is important to notice that while the progressive construction in (41) is the spell-out of the IPV_{PROG} operator, the imperfective morphology bared by the verb in (38) is not. This morphology is the spell out of the PAST-HOM compound as we argued in chapter 2. On the other hand, the past imperfective morphology we seen on the auxiliary in (41) is also the spell out of the PAST-HOM compound, namely of a tempus infectum. The occurrence of an infectum morphology in the auxiliaries of progressive construction is expected according to the definition of the IPV_{PROG} operator we gave in (34) since the application of IPV_{PROG} gives temporal properties which are homogeneous. For the same reason, the auxiliary of progressive constructions can never bare perfectum morphology. This prediction is borne out by the following Italian facts

(42) Maria sta attraversando la strada

Mary is-PRES crossing the street

(43) Maria stava attraversando la strada

Mary was-PASTimp crossing the street

(44) *Maria stette attraversando la strada

Mary was-PASTperf crossing the street

As we can see from the sentences above, the progressive sentences are fine when the auxiliary morphology is Presente or Imperfetto, namely the spell-out of a tempus infectum, but are bad when it is a tempus perfectum.[12] One problematic prediction of my proposal is that sentences

[12] As we have seen, present habits are conveyed by the use of the present tense in English. Given the proposed English tense architecture and its analogies to the Romance system, we would expect past habits to be conveyed by the use of the simple past tense in English (being the morphological English simple past ambiguous between

like

(45) *Maria stette attraversando la strada per due minuti
Mary was-PASTperf crossing the street for two minutes

should be grammatical in Italian, which is not actually the case. Since these sentences are fine in other Romance languages like European Portuguese, we could try to assume this fact as idiosyncrasy of Italian. As shown by the European Portuguese sentences below, when a temporal adverbial quantizes the temporal property it modifies, the tense of the sentence is a tempus perfectum, even in progressive constructions

(46) A Maria esteve a correr durante duas horas
Mary was-PASTperf to run for two years

(47) A Maria esteve a desenhar um círculo durante duas horas
Mary was-PASTperf to draw a circle for two years

Moreover, the gerundive construction with perfective morphology on the auxiliary is used in southern European Portuguese as shown by the sentences below

(48) A Maria esteve correndo durante duas horas (southern EP)
Mary was-PASTperf running for two years

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the spell-out of a tempus perfectum and of a tempus infectum). Actually this is not the case; past habits are not usually conveyed by the use of the simple past but by the use of the "used to" construction, as shown by the sentence below

(i) John used to go to church on Sundays

On the contrary, the following simple past sentence

(ii) John went to church on Sunday

has only an eventive perfective interpretation. We could assume that pragmatic restrictions are responsible for this fact. Namely we could assume the sentence

(iii) John ate at noon

to be actually ambiguous between (a) that there is a past event of *John eating at noon* and (b) that *John had the habit of eating at noon* and then we could say that English morphologizes the HAB operator by the "used to" construction in simple past sentences to get pragmatically rid of this ambiguity. This strategy would not be necessary in Romance languages where we find two dinstinct morphological realizations for the PAST-infectum and the PAST-perfectum tenses. One could dispute that such a stipulation would be in contrast with Romance language data since present tense sentences with event predicates are ambiguous between a present ongoing and

(49) A Maria esteve desenhando um círculo durante duas horas (southern EP)
Mary was-PASTperf to draw a circle for two years

3.3 Conclusions

In this chapter we have seen how we can extend the homogeneity account to English. In order to do so we have assumed that the English simple past morphology is ambiguous between the spell-out of a tempus infectum and of a tempus perfectum. We proposed how progressive constructions are to be integrated in the homogeneity proposal by discussing some of the accounts of English progressive and we extended the results to Romance languages.

a present habitual interpretation and we do not find "use to" constructions conveying these latters. One possible answer to this objection could be that English wants to get rid of the Perfectum-Infectum ambiguity and not of the habitual-ongoing ambiguity that arises under the very same infectum tense in Romance languages. The assumption of the overt realization of the IPV_{PROG} operator in English would find here further evidence.

4 EMPIRICAL SUPPORT

The empirical facts discussed in this dissertation mostly come from introspection and from the broad literature about tense and aspect (which are mostly introspective data). The main motivation for using this kind of data was to provide linguistic contrasts as primitive and as minimal as possible to our theoretical analysis, in order to make clear and to circumscribe the linguistic phenomena we wanted to explain. This data source, though extremely important for theoretical linguistics given the above reasons, is however required to be further integrated by other kind of data sources, such as corpus and/or experimental, in order to give a more empirical and a more independent support (*corroboration* is our far ideal) to the theoretical proposal I have made. In this chapter I will present two pilot studies I made at the Università degli Studi di Milano-Bicocca which support my introspective data and, moderately, my theoretical hypothesis.

In these studies I looked for an empirical confirmation of the adverbial distribution facts I assumed in this dissertation, and I looked whether there is a correlation between the distributive variations I found and the particular adverbial-tense combination in a sentence; this was done by looking at the time needed to the subjects to judge the sentence as acceptable. This was done by simply presenting to Italian adult speakers the following four Italian sentence types

- Passato Remoto sentences containing a “per x time” adverbial (henceforth RP)
- Passato Remoto sentences containing a “da x time” adverbial (henceforth RD)
- Imperfetto sentences containing a “per x time” adverbial (henceforth IP)
- Imperfetto sentences containing a “da x time” adverbial (henceforth ID)

and by asking them to judge the sentences as acceptable or non-acceptable.

4.1 A pilot study with questionnaires.

In this pilot study I asked 14 Italian speakers to give an acceptability judgement to 12 sentences (3 sentences from each of the four groups above) containing a state predicate and no modifiers except for the durative temporal adverbial. The sentences were presented together with 15 filler sentences in a questionnaire in pseudo-random order. The subjects had to read the sentences in the questionnaire and judge them. Here below one sample page from the

questionnaire

The answers from the 14 questionnaires were put together and the “acceptable” answers from each of the 4 sentence types were counted. The data I obtained are represented in the histogram in figure 1 below: while 95,23% of the RP sentences were accepted by the subjects, only 7,14% of the RD sentences were; on the other hand, 97,26% of the ID sentences and 11,9% of IP sentences were accepted.

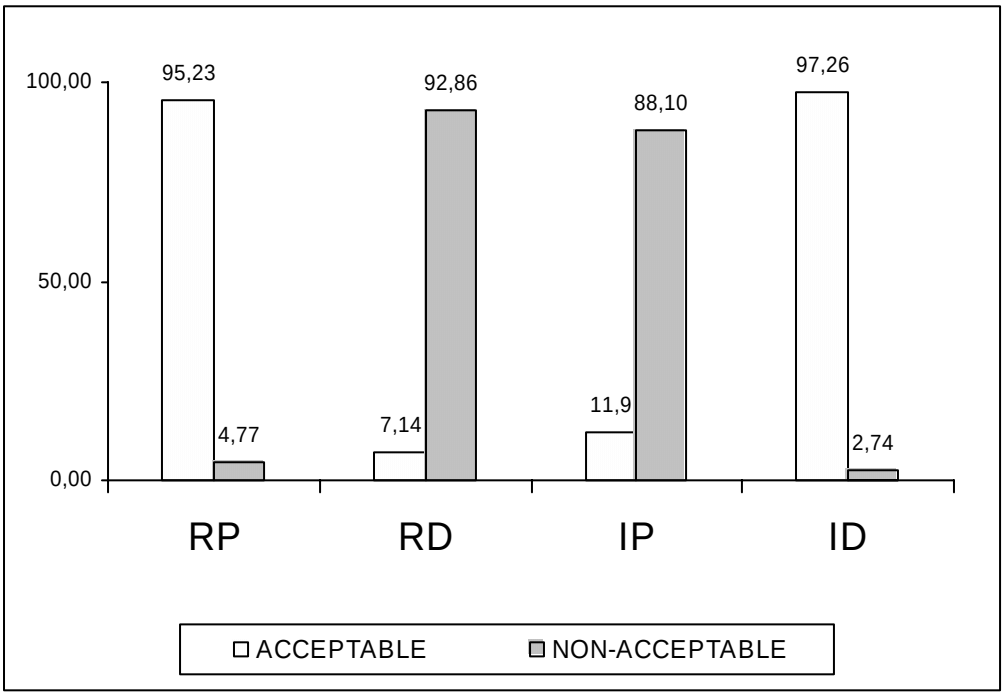


FIG. 1

The data from this pilot study confirmed our Italian adverbial distribution assumption.

Though the positive results confirmed our assumptions, there was however a certain number of unexpected answers as we can see from the histogram in figure 1 (since our theory predicts the Passato remoto to be bad in combination with *da x time* adverbials, and the Imperfetto to be bad in combination with *per x time* adverbials). In a second study, I will present below, apart from looking if the above results were confirmed with a larger number of sentences and a larger number of subjects, I looked if there were any correlations between the unexpected data of the two sentence types by looking at *judgement times*.

4.2 Reaction times study.

In this study I presented to the subjects a larger number of sentences and I recorded the times they took to give their judgements. This was done with the help of a computer. The motivations for looking at judgements times were essentially the following: if we find that, when accepted, RD and IP sentences require significant larger *judgement times* than RP and ID sentences, then, the acceptability of RD and IP sentences differ from the acceptability of RP and ID sentences under some respects. As we will see, this was exactly so: RD and IP judgement times were significantly and uniformly larger than RP and ID judgement times. Since the acceptability of RP and ID sentences requires extra time costs we concluded that the acceptability of RD and IP sentences requires extra operations.

4.2.1 Method

4.2.1.1 Participants.

20 Italian mother-tongue adults were recruited in the Milan area in Italy. The mean age of the subjects was 28,9 years (range=360–267 months). The data from 3 additional adults were not included: two subjects for average judgement times more than 8 sec. in more of the half of the target sentences, one subject for RDY and RPY judgement times paradoxically smaller then all other judgement times (see fig.3).

4.2.1.2 Stimuli

- 5 RP sentences
- 5 RD sentences
- 5 IP sentences
- 5 ID sentences
- 14 FILL_OK sentences (grammatical filler sentences)
- 16 FILL_BAD sentences (ungrammatical filler sentences)

Apart from the filler sentences which presented a sensible variation, the length of the trial sentences was of 7 words and approximately of 39,7 characters (range = 38 – 40); They contained a state predicate and no modifiers, except from the durative temporal adverbial; lexical frequency was also taken into consideration. Here below some of the stimulus sentences:

- IP sentence = Marcello possedeva un bar per tre anni
- ID sentence = I fidanzati si conoscevano da dieci mesi
- RP sentence = Antonio abitò a Parigi per cinque anni
- RD sentence = I Navigli furono sporchi da venti anni
- FILL_BAD sentence = Il poeta sul palco sta rimanendo seduto
- FILL_OK sentence = Antonio lavora a Milano

4.2.1.3 Design and procedure

The experiment was conducted in the psychology laboratory of the Università degli Studi di Milano-Bicocca. The *Matlab* program with *Psychtoolbox* functions running on a Toshiba computer presented the 50 sentences on a PC screen. The sentences were presented randomly. The subjects were required to read the sentences on the screen (aloud reading was allowed) and to judge them as acceptable or non-acceptable; acceptable by pressing the “F” key of the PC keyboard with the left hand, non-acceptable by pressing the “J” key with the left hand; the keys were coloured with different colours in order to facilitate the task. Judgement times, measuring the interval stretching from the appearing of the sentence and the subject key press, were recorded.

4.2.2 Results and discussion

The first thing we did was to count the subject judgements for every sentence and we found the data represented in the table 1 below

SENTENCE NUMBER	SENTENCE TYPE	STATISTIC DISTRIBUTION	OBSERVED DISTRIBUTION	PREDICTED DISTRIBUTION
3	RP	,50	1	1
12	RP	,50	1	1
21	RP	,50	,95	1
25	RP	,50	1	1
34	RP	,50	,90	1
7	RD	,50	,05	0
15	RD	,50	0	0
18	RD	,50	,10	0
28	RD	,50	0	0
30	RD	,50	,05	0
10	IP	,50	0	0
16	IP	,50	,10	0
22	IP	,50	,10	0
31	IP	,50	,05	0
33	IP	,50	0	0
5	ID	,50	,90	1
13	ID	,50	1	1
19	ID	,50	1	1
24	ID	,50	,90	1
27	ID	,50	,90	1

Then we looked at the judgement for sentence type in the whole population and we found the data represented in the histogram in figure 2 below

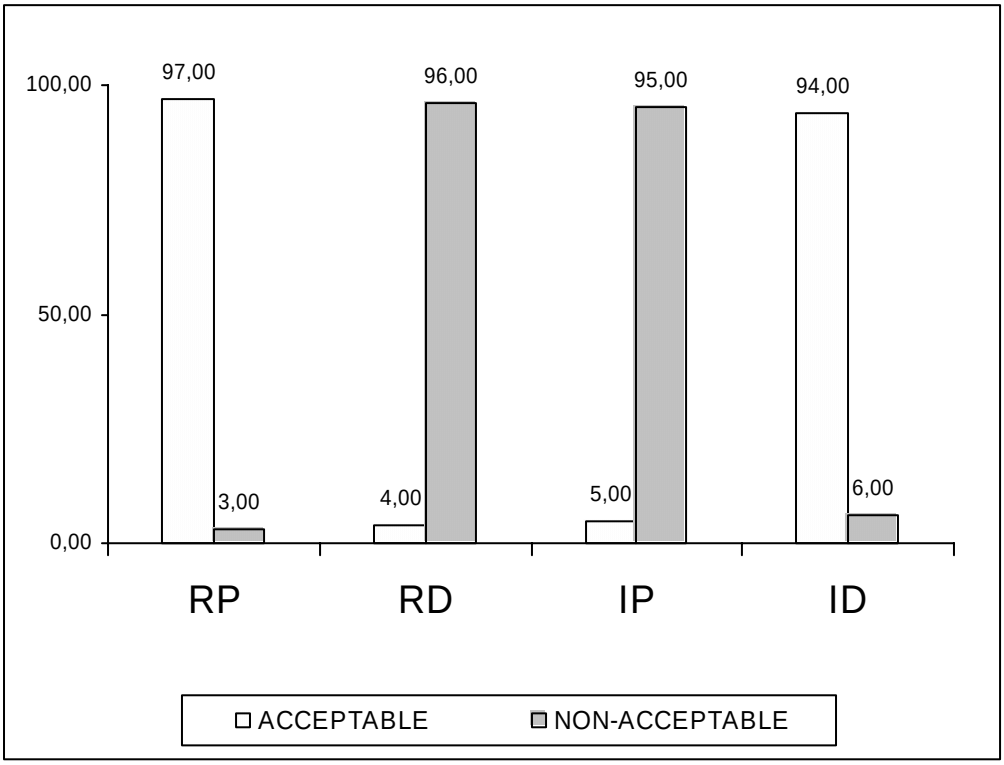


FIG. 2

As we can see, the data of the pilot study are confirmed.

Secondly, we looked at the mean of the reaction times of every sentence type; the data are represented in figure 3 below where the error bar represent the standard variations of the means

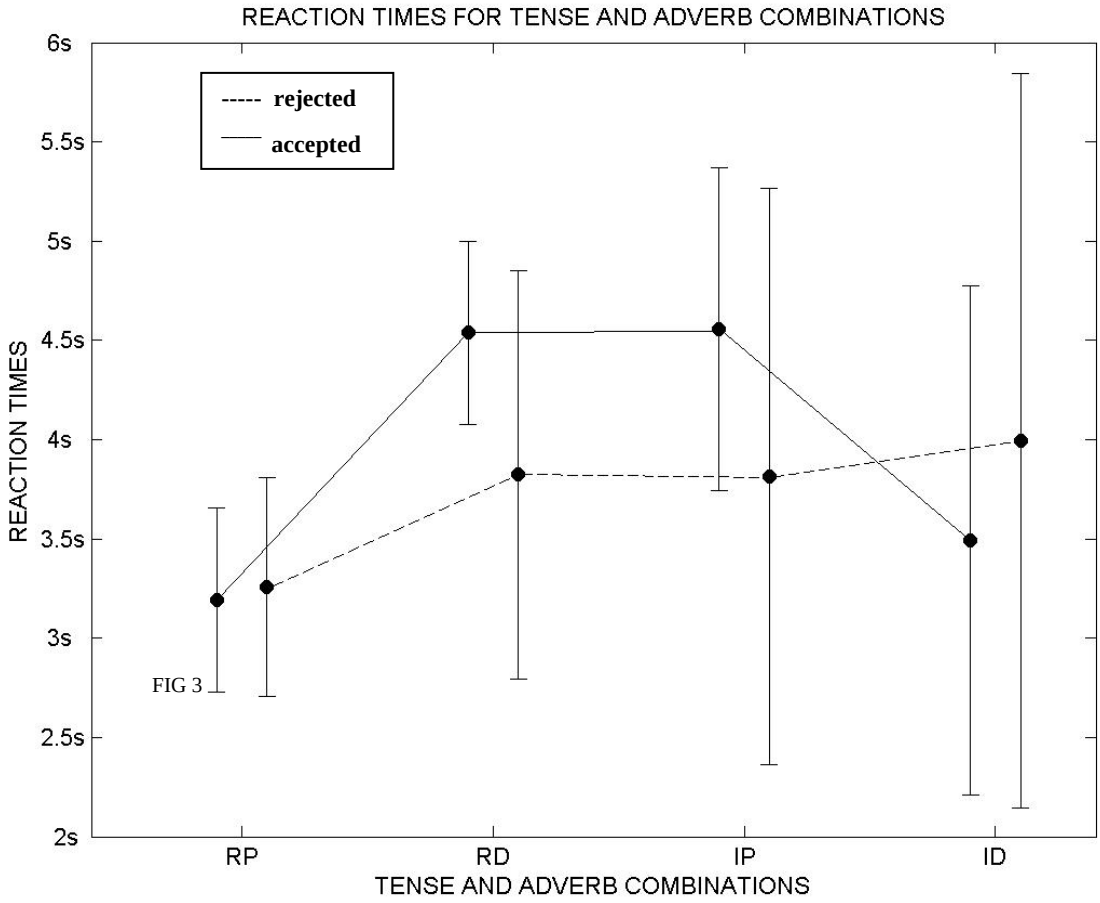


FIG 3

As we can see form figure 3, reaction times for RP and ID sentence acceptability (the time needed for judging the sentence as acceptable) was smaller than the reaction times for RD and IP sentence acceptability; moreover the reaction times for RP and ID sentence acceptability was smaller than the reaction times for RP and ID sentence rejection while the reaction times for RD and IP sentence acceptability was larger than the reaction times for RD and IP sentence rejection. However we found a sensible standard variation. Given this fact, we decided to look at the reaction times differences in each subject. We considered the following four differences between reaction times in each subject:

(i) the difference between the reaction times for RD sentence acceptability (RDY) and the reaction times for RD sentence rejection (RDN)

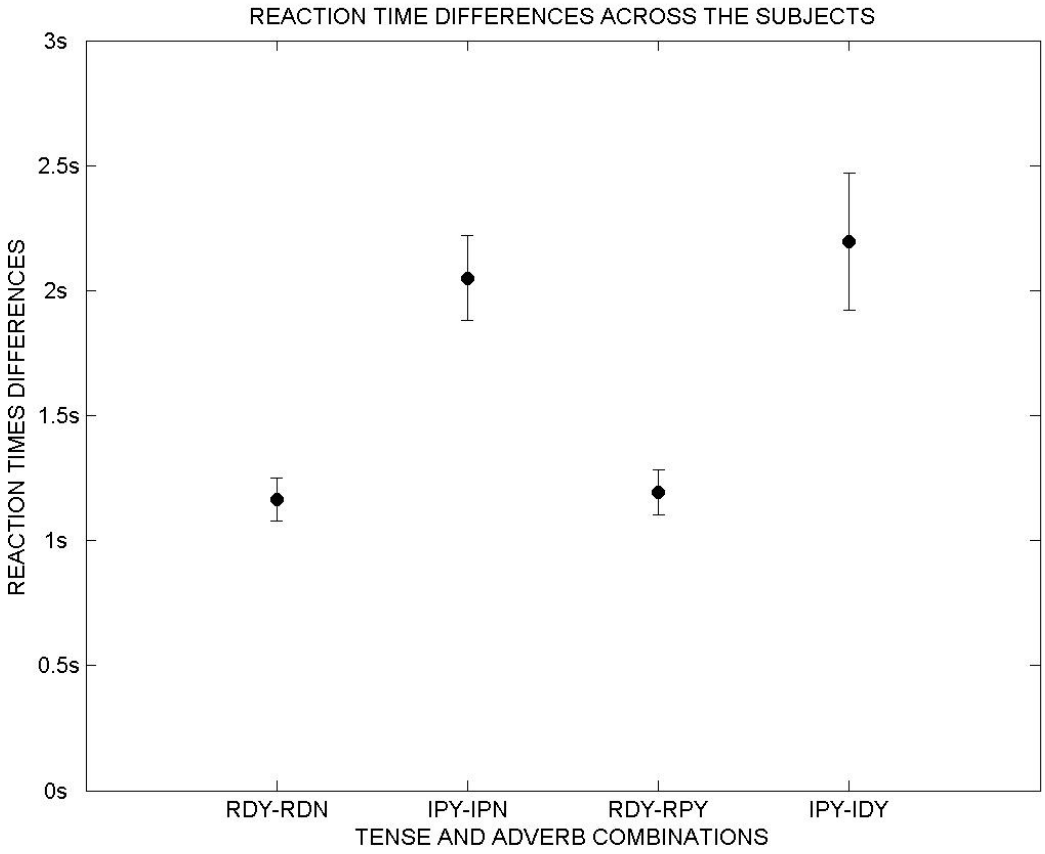
(ii) the difference between the reaction times for RD sentence acceptability (RDY) and the reaction times for RP sentence acceptability (RPY)

(iii) the difference between the reaction times for IP sentence acceptability (IPY) and the

reaction times for IP sentence rejection (IPN)

(iv) the difference between the reaction times for IP sentence acceptability (IPY) and the reaction times for ID sentence acceptability (IDY)

The data are represented in figure 4 below



As we can see from figure 4 above, interestingly we found out that the differences between the judgement times for RDY, RDN, RPY and IPY, IPN, IDY sentences in each subject are relatively constant across the subjects

4.2.3 A Possible Explanation

Since the acceptability of IP and RD sentences requires extra time costs, it is natural to assume that these extra time costs are due to extra linguistic operations that are required in order to achieve a resolution of the homogeneity troubles associated with the LF of IP and RD sentences. Given the temporal architecture of these sentences, two are the consequent ways we can imagine this is done.

We can imagine that in order to resolve the clash between the homogeneity conditions and the temporal character of the adverbial modified temporal property, the subjects

"accommodate" the presuppositions associated with tense. The basic idea is that the subjects accommodate these presupposition by assuming "per x time" modified temporal properties to be homogeneous and "da x time" modified temporal properties to be non homogeneous. This is rather implausible. Consider in fact the following sentence

(1) ??Mario era malato per due giorni
Mario was-Past.IMP sick for two days

In order to accommodate the homogeneity presuppositions associated with the tense, the temporal property "*Mario-be-sick-for-two-days*" is assumed to be homogeneous, that is, we require that every subinterval of the interval introduced by tense is two-days-long. This is clearly implausible.

There is an alternative and more reasonable way of explaining the extra time costs for IP and RD sentences. We can assume that in order to solve the homogeneity clash, the subjects drop the presupposition associated with tense and the tense is reinterpreted according to the homogeneity character of the temporal predicate. That is to say, in processing sentence (1) as acceptable, the subjects drop the homogeneity presupposition associated with the Imperfetto and they reinterpret the tense according to the non-homogeneity character of the tense complement. The tense complement, which is λt(Mario-be-sick-for-two-days(t)), denotes a non-homogeneous temporal property, the tense is reinterpreted as a tempus perfectum, a tense selecting for temporally non-homogeneous predicates. Both the proposals are however interesting since they are concerned with the problem of the empirical study of presuppositions violations.

APPENDIX - CHAPTER 4:

MATERIALS AND RESULTS OF THE EXPERIMENT

STIMULUS SENTENCES

SENTENCE NUMBER	STIMULUS SENTENCE	SENTENCE TYPE
1	GALILEO GALILEI MORÌ SOLO E IN MISERIA	FILL
2	DOMANI FRANCESCA ERA NATA A FIRENZE	FILL
3	PICASSO ABITÒ A PARIGI PER NOVE ANNI	RP
4	IERI SERA MANZONI STUDIERA` A MILANO	FILL
5	LO STUDENTE ERA MALATO DA DUE GIORNI	ID
6	ANTONIO STA COMPRANDO UNA NUOVA AUTO	FILL
7	IL FIUME ADDA FU SPORCO DA VENTI ANNI	RD
8	IERI ALESSANDRA INDOSSA UNA BELLA GONNA	FILL
9	EDO E RITA NON SI PARLANO DA SETTIMANE	FILL
10	LELE AVEVA PAURA DEL BUIO PER DUE ANNI	IR
11	NEL 1474 COLOMBO PARTIRANNO IL BRASILE	FILL
12	LA CASA PUZZÒ DI MUFFA PER DUE GIORNI	RP
13	LA SEGRETARIA LO AMAVA DA DIECI ANNI	ID
14	LA CASA DI VIRGILIO ERA BASSA E LARGA	FILL
15	A NATALE EVA VISSE A ROMA DA DUE ANNI	RD
16	NEL 1980 IL NIGER ERA IN PACE PER DUE ANNI	IP
17	GIOTTO FU A MILANO INTORNO AL 1335-1336	FILL
18	IL CAMPO PROFUMÒ DI MENTA DA DUE GIORNI	RD
19	I FIDANZATI SI CONOSCEVANO DA TRE MESI	ID
20	MIO NONNO ERA BRAVISSIMO UN FALEGNAME	FILL
21	LO STUDENTE RIMASE IN PIEDI PER TRE ORE	RP
22	IL COMMESSO ERA SCORTESE PER DUE ORE	IP
23	PLATONE SCRISSE DEI DIALOGHI FILOSOFICI	FILL
24	CARLA SERRA ERA INCINTA DA TRE MESI	ID
25	IL CAPO SI SENTÌ MALE PER TRE GIORNI	RP
26	NEL GENNAIO 1941 LA FRANCIA ERA GUERRA	FILL
27	MARCELLO AVEVA UN CANE DA DIECI ANNI	ID
27	IL LOCALE FU PIENO DI GENTE DA DUE ORE	RD
29	A MIO PADRE PIACEVANO I ROMANZI GIALLI	FILL
30	IL VAGABONDO EBBE FAME DA DUE GIORNI	RD

31	CARLO POSSEDEVA UN BAR PER TRE ANNI	IP
32	LA DISFATTA DI CAPORETTO FU CRUENTA	FILL
33	FERRARA ERA GRASSO PER VENTI ANNI	IP
34	EVA EBBE LA FEBBRE PER VENTI GIORNI	RP
35	E´ IL MIO FLAUTO CHE HO PERSO SUL TRENO	FILL
36	LA SUA FOTO DEL PRESIDENTE E´ OVUNQUE	FILL
37	GIVANNI EBBE I CAPELLI RICCI E NERI	FILL
38	LA BOMBA E´ ESPLOSA SINO A NOTTE FONDA	FILL
39	IL POETA SUL PALCO STA RIMANENDO SEDUTO	FILL
40	LEO VA A TROVARE SUA NONNA DUE VOLTE	FILL
41	MARTA COMINCIA A POSSEDERE UNA CASA	FILL
42	ELENA HA FINITO DI SOFFRIRE PER LUI	FILL
43	IL CONCERTO E´ A SCOPO DI BENEFICIENZA	FILL
44	I MIGLIORI SONO I GIOCATORI STRANIERI	FILL
45	TUTTI DICONO QUEL QUADRO DI TIZIANO	FILL
46	LE CREDEVANO SUO MARITO FEDELE	FILL
47	LO SPORT MANTIENE IL FISICO SANO	FILL
48	GIANNI HA SCRITTO PIU` CHE LETTO	FILL
49	ESCLUSIVAMENTE MARIA VA AL CINEMA	FILL
50	OGGI VIDI MIA SORELLA IN STAZIONE	FILL

SUBJECT ANSWERS[1]:

Sentence number: see table above
Sentence type: 10 = FILL, 11 = RP, 12 = RD, 13 = IP, 14 = ID
Answer type: 1 = acceptable, -1 = non-acceptable
Reaction time: in secs.

MATRIX LEGENDA

S1				S2			
Sentence number	Sentence type	Reaction time	Answer type	Sentence number	Sentence type	Reaction time	Answer type

[1] Answer files are electronically available from the author

S1

24.0000	14.0000	3.4171	1.0000
20.0000	10.0000	2.5528	-1.0000
18.0000	12.0000	4.5287	1.0000
45.0000	10.0000	3.9502	-1.0000
46.0000	10.0000	4.4875	-1.0000
11.0000	10.0000	3.4660	-1.0000
42.0000	10.0000	3.0757	1.0000
31.0000	13.0000	4.0607	-1.0000
6.0000	10.0000	3.8350	-1.0000
38.0000	10.0000	3.0770	-1.0000
22.0000	13.0000	3.5463	-1.0000
33.0000	13.0000	3.0406	-1.0000
4.0000	10.0000	2.5788	-1.0000
49.0000	10.0000	2.9123	-1.0000
12.0000	11.0000	3.0550	1.0000
36.0000	10.0000	3.6322	-1.0000
21.0000	11.0000	3.4202	1.0000
2.0000	10.0000	1.6969	-1.0000
5.0000	14.0000	2.8441	1.0000
29.0000	10.0000	4.0769	1.0000
39.0000	10.0000	4.8081	1.0000
15.0000	12.0000	3.5049	-1.0000
30.0000	12.0000	4.1251	1.0000
3.0000	11.0000	3.5032	1.0000
9.0000	10.0000	3.1085	1.0000
16.0000	13.0000	4.6184	-1.0000
50.0000	10.0000	4.3185	-1.0000
7.0000	12.0000	2.4214	-1.0000
1.0000	10.0000	5.6412	1.0000
19.0000	14.0000	2.5882	1.0000
47.0000	10.0000	2.6757	-1.0000
44.0000	10.0000	2.6642	-1.0000
48.0000	10.0000	2.8554	1.0000
10.0000	13.0000	3.6212	-1.0000
32.0000	10.0000	3.8960	-1.0000
14.0000	10.0000	1.9821	1.0000
41.0000	10.0000	3.0703	1.0000
35.0000	10.0000	2.4665	1.0000
37.0000	10.0000	3.4260	-1.0000
8.0000	10.0000	2.7661	-1.0000
25.0000	11.0000	2.8073	1.0000
13.0000	14.0000	3.6979	1.0000
28.0000	12.0000	3.7440	-1.0000
17.0000	10.0000	3.7967	-1.0000
43.0000	10.0000	3.5826	-1.0000
23.0000	10.0000	2.3970	1.0000
40.0000	10.0000	3.5688	-1.0000
34.0000	11.0000	2.5709	1.0000
26.0000	10.0000	2.3557	-1.0000
27.0000	14.0000	2.6267	1.0000

S2

24.0000	14.0000	7.4758	-1.0000
31.0000	13.0000	5.1213	-1.0000
8.0000	10.0000	4.2317	-1.0000
42.0000	10.0000	9.1051	1.0000
21.0000	11.0000	4.5580	1.0000
25.0000	11.0000	5.2688	1.0000
15.0000	12.0000	7.4726	-1.0000
50.0000	10.0000	9.7298	-1.0000
27.0000	14.0000	7.9272	1.0000
30.0000	12.0000	3.5722	-1.0000
39.0000	10.0000	11.4068	1.0000
26.0000	10.0000	5.1993	1.0000
2.0000	10.0000	2.9992	-1.0000
29.0000	10.0000	3.1751	1.0000
49.0000	10.0000	10.1010	1.0000
22.0000	13.0000	6.1385	-1.0000
44.0000	10.0000	3.2166	1.0000
16.0000	13.0000	13.1055	-1.0000
19.0000	14.0000	3.8723	1.0000
36.0000	10.0000	3.4014	1.0000
48.0000	10.0000	3.0612	1.0000
10.0000	13.0000	7.5845	-1.0000
33.0000	13.0000	4.4398	-1.0000
7.0000	12.0000	6.8008	-1.0000
35.0000	10.0000	4.5132	1.0000
4.0000	10.0000	5.6050	-1.0000
46.0000	10.0000	11.9517	-1.0000
38.0000	10.0000	5.2306	-1.0000
28.0000	12.0000	5.0883	-1.0000
3.0000	11.0000	4.4432	1.0000
11.0000	10.0000	11.8457	-1.0000
40.0000	10.0000	7.7842	1.0000
43.0000	10.0000	9.0190	1.0000
47.0000	10.0000	2.7991	1.0000
14.0000	10.0000	3.5641	1.0000
32.0000	10.0000	4.1061	1.0000
6.0000	10.0000	2.8066	1.0000
12.0000	11.0000	14.2981	1.0000
23.0000	10.0000	7.1620	1.0000
9.0000	10.0000	3.7441	1.0000
45.0000	10.0000	15.9656	-1.0000
41.0000	10.0000	4.7931	1.0000
37.0000	10.0000	8.0778	1.0000
5.0000	14.0000	2.6169	1.0000
20.0000	10.0000	5.9460	-1.0000
18.0000	12.0000	6.2497	-1.0000
13.0000	14.0000	3.4107	1.0000
34.0000	11.0000	2.8569	1.0000
17.0000	10.0000	2.7753	1.0000
1.0000	10.0000	2.8409	1.0000

S3

42.0000	10.0000	5.5918	1.0000
49.0000	10.0000	2.5372	-1.0000
41.0000	10.0000	6.1165	-1.0000
5.0000	14.0000	4.7967	1.0000
35.0000	10.0000	5.4618	1.0000
1.0000	10.0000	4.0529	1.0000
44.0000	10.0000	7.4665	-1.0000
38.0000	10.0000	3.9088	-1.0000
37.0000	10.0000	8.1348	-1.0000
47.0000	10.0000	2.5095	1.0000
18.0000	12.0000	7.2522	-1.0000
45.0000	10.0000	4.2955	-1.0000
3.0000	11.0000	5.2849	1.0000
22.0000	13.0000	3.3152	-1.0000
19.0000	14.0000	8.8336	1.0000
17.0000	10.0000	5.9407	1.0000
25.0000	11.0000	16.9477	1.0000
7.0000	12.0000	3.7719	-1.0000
28.0000	12.0000	3.9471	-1.0000
48.0000	10.0000	3.4009	1.0000
11.0000	10.0000	11.3651	-1.0000
33.0000	13.0000	4.2560	-1.0000
20.0000	10.0000	8.3868	-1.0000
4.0000	10.0000	2.9321	-1.0000
27.0000	14.0000	11.2911	1.0000
24.0000	14.0000	9.1716	1.0000
10.0000	13.0000	4.8011	-1.0000
30.0000	12.0000	4.4595	-1.0000
14.0000	10.0000	3.0077	1.0000
16.0000	13.0000	10.3440	-1.0000
46.0000	10.0000	7.1434	1.0000
2.0000	10.0000	5.7904	-1.0000
29.0000	10.0000	2.4857	1.0000
6.0000	10.0000	2.8411	1.0000
26.0000	10.0000	6.6047	-1.0000
21.0000	11.0000	2.3620	1.0000
40.0000	10.0000	6.7287	-1.0000
31.0000	13.0000	7.4955	-1.0000
15.0000	12.0000	4.9692	-1.0000
13.0000	14.0000	2.9931	1.0000
23.0000	10.0000	3.9605	1.0000
9.0000	10.0000	3.5845	1.0000
8.0000	10.0000	3.1486	-1.0000
39.0000	10.0000	14.2822	1.0000
34.0000	11.0000	3.4555	1.0000
43.0000	10.0000	4.5023	1.0000
12.0000	11.0000	2.4300	1.0000
32.0000	10.0000	4.2294	1.0000
36.0000	10.0000	3.6962	-1.0000
50.0000	10.0000	5.1107	-1.0000

S4

42.0000	10.0000	2.4560	1.0000
49.0000	10.0000	3.7192	-1.0000
41.0000	10.0000	7.1838	-1.0000
5.0000	14.0000	1.9528	1.0000
35.0000	10.0000	5.0026	-1.0000
1.0000	10.0000	2.1150	1.0000
44.0000	10.0000	6.0382	-1.0000
38.0000	10.0000	4.0629	1.0000
37.0000	10.0000	11.6628	-1.0000
47.0000	10.0000	3.2991	1.0000
18.0000	12.0000	5.8019	-1.0000
45.0000	10.0000	3.7326	-1.0000
3.0000	11.0000	2.1028	1.0000
22.0000	13.0000	3.2809	-1.0000
19.0000	14.0000	4.2086	1.0000
17.0000	10.0000	2.9761	-1.0000
25.0000	11.0000	4.3072	1.0000
7.0000	12.0000	2.9563	-1.0000
28.0000	12.0000	2.7007	-1.0000
48.0000	10.0000	3.2673	-1.0000
11.0000	10.0000	5.8016	-1.0000
33.0000	13.0000	3.5180	-1.0000
20.0000	10.0000	3.3399	-1.0000
4.0000	10.0000	2.6339	-1.0000
27.0000	14.0000	10.4485	1.0000
24.0000	14.0000	3.9804	1.0000
10.0000	13.0000	2.7434	-1.0000
30.0000	12.0000	5.3534	-1.0000
14.0000	10.0000	2.2594	1.0000
16.0000	13.0000	4.8281	-1.0000
46.0000	10.0000	4.4898	-1.0000
2.0000	10.0000	3.6238	-1.0000
29.0000	10.0000	2.4296	1.0000
6.0000	10.0000	2.4317	1.0000
26.0000	10.0000	2.8809	-1.0000
21.0000	11.0000	3.6889	1.0000
40.0000	10.0000	3.4588	-1.0000
31.0000	13.0000	2.4675	-1.0000
15.0000	12.0000	5.3378	-1.0000
13.0000	14.0000	3.7611	1.0000
23.0000	10.0000	3.6249	1.0000
9.0000	10.0000	4.1574	1.0000
8.0000	10.0000	3.5284	-1.0000
39.0000	10.0000	4.0944	1.0000
34.0000	11.0000	3.5492	-1.0000
43.0000	10.0000	3.5584	1.0000
12.0000	11.0000	7.6259	1.0000
32.0000	10.0000	2.9861	-1.0000
36.0000	10.0000	4.6454	1.0000
50.0000	10.0000	2.9125	-1.0000

S5

24.0000	14.0000	4.5268	1.0000
31.0000	13.0000	4.1990	-1.0000
8.0000	10.0000	3.0757	-1.0000
42.0000	10.0000	3.6650	1.0000
21.0000	11.0000	3.2116	1.0000
25.0000	11.0000	2.8676	1.0000
15.0000	12.0000	4.3890	-1.0000
50.0000	10.0000	3.7350	-1.0000
27.0000	14.0000	3.3337	1.0000
30.0000	12.0000	3.0035	-1.0000
39.0000	10.0000	5.3281	1.0000
26.0000	10.0000	3.7521	1.0000
2.0000	10.0000	2.9672	-1.0000
29.0000	10.0000	6.7124	1.0000
49.0000	10.0000	9.5309	1.0000
22.0000	13.0000	5.6510	-1.0000
44.0000	10.0000	4.6233	1.0000
16.0000	13.0000	6.5126	-1.0000
19.0000	14.0000	3.6064	1.0000
36.0000	10.0000	10.5617	-1.0000
48.0000	10.0000	3.6295	1.0000
10.0000	13.0000	3.3196	-1.0000
33.0000	13.0000	5.1567	-1.0000
7.0000	12.0000	4.1589	-1.0000
35.0000	10.0000	4.8726	1.0000
4.0000	10.0000	4.6944	-1.0000
46.0000	10.0000	7.1937	-1.0000
38.0000	10.0000	5.9693	-1.0000
28.0000	12.0000	2.5484	-1.0000
3.0000	11.0000	3.3248	1.0000
11.0000	10.0000	5.6420	-1.0000
40.0000	10.0000	4.9943	-1.0000
43.0000	10.0000	3.6883	1.0000
47.0000	10.0000	2.3753	1.0000
14.0000	10.0000	2.6675	1.0000
32.0000	10.0000	3.4783	1.0000
6.0000	10.0000	2.6726	1.0000
12.0000	11.0000	3.1882	1.0000
23.0000	10.0000	4.5286	1.0000
9.0000	10.0000	3.9678	1.0000
45.0000	10.0000	15.3430	1.0000
41.0000	10.0000	8.1014	1.0000
37.0000	10.0000	6.9967	-1.0000
5.0000	14.0000	4.8449	1.0000
20.0000	10.0000	4.1341	-1.0000
18.0000	12.0000	4.2270	-1.0000
13.0000	14.0000	3.9220	1.0000
34.0000	11.0000	2.9099	1.0000
17.0000	10.0000	3.2221	1.0000
1.0000	10.0000	4.0060	1.0000

S6

24.0000	14.0000	2.3897	1.0000
31.0000	13.0000	2.1557	-1.0000
8.0000	10.0000	2.2374	-1.0000
42.0000	10.0000	1.9187	1.0000
21.0000	11.0000	2.1681	1.0000
25.0000	11.0000	1.8675	1.0000
15.0000	12.0000	2.4626	-1.0000
50.0000	10.0000	1.7430	1.0000
27.0000	14.0000	2.8693	1.0000
30.0000	12.0000	2.6215	-1.0000
39.0000	10.0000	3.0380	-1.0000
26.0000	10.0000	3.0227	-1.0000
2.0000	10.0000	2.6781	1.0000
29.0000	10.0000	2.0491	1.0000
49.0000	10.0000	2.8014	-1.0000
22.0000	13.0000	4.4200	1.0000
44.0000	10.0000	2.9188	-1.0000
16.0000	13.0000	4.5040	1.0000
19.0000	14.0000	1.7908	1.0000
36.0000	10.0000	4.3244	-1.0000
48.0000	10.0000	1.8767	1.0000
10.0000	13.0000	2.9361	-1.0000
33.0000	13.0000	2.0426	-1.0000
7.0000	12.0000	2.1788	-1.0000
35.0000	10.0000	3.6222	1.0000
4.0000	10.0000	2.9385	-1.0000
46.0000	10.0000	3.4192	-1.0000
38.0000	10.0000	3.6626	-1.0000
28.0000	12.0000	3.0010	-1.0000
3.0000	11.0000	1.7124	1.0000
11.0000	10.0000	3.0894	-1.0000
40.0000	10.0000	3.8298	1.0000
43.0000	10.0000	2.0002	1.0000
47.0000	10.0000	1.7953	1.0000
14.0000	10.0000	1.9459	1.0000
32.0000	10.0000	1.9968	1.0000
6.0000	10.0000	2.1725	1.0000
12.0000	11.0000	2.1347	1.0000
23.0000	10.0000	1.9218	1.0000
9.0000	10.0000	1.7457	1.0000
45.0000	10.0000	3.5949	1.0000
41.0000	10.0000	2.1601	1.0000
37.0000	10.0000	2.1259	1.0000
5.0000	14.0000	1.5781	1.0000
20.0000	10.0000	3.1819	-1.0000
18.0000	12.0000	3.3895	-1.0000
13.0000	14.0000	1.7507	1.0000
34.0000	11.0000	1.9566	1.0000
17.0000	10.0000	3.1180	1.0000
1.0000	10.0000	1.9129	1.0000

S7

42.0000	10.0000	2.3445	1.0000
49.0000	10.0000	2.2889	1.0000
41.0000	10.0000	2.5482	-1.0000
5.0000	14.0000	2.2267	1.0000
35.0000	10.0000	1.9926	1.0000
1.0000	10.0000	2.6191	1.0000
44.0000	10.0000	2.2632	1.0000
38.0000	10.0000	1.8123	-1.0000
37.0000	10.0000	3.1985	1.0000
47.0000	10.0000	1.9569	1.0000
18.0000	12.0000	2.0126	-1.0000
45.0000	10.0000	2.5941	-1.0000
3.0000	11.0000	2.1934	1.0000
22.0000	13.0000	1.8442	-1.0000
19.0000	14.0000	2.1490	1.0000
17.0000	10.0000	2.2059	1.0000
25.0000	11.0000	1.9391	1.0000
7.0000	12.0000	2.3166	-1.0000
28.0000	12.0000	2.1777	-1.0000
48.0000	10.0000	1.7777	1.0000
11.0000	10.0000	3.5279	-1.0000
33.0000	13.0000	1.8812	-1.0000
20.0000	10.0000	1.4265	1.0000
4.0000	10.0000	2.3208	-1.0000
27.0000	14.0000	2.6527	1.0000
24.0000	14.0000	2.5456	1.0000
10.0000	13.0000	2.8206	-1.0000
30.0000	12.0000	4.0668	-1.0000
14.0000	10.0000	1.8227	1.0000
16.0000	13.0000	2.8110	-1.0000
46.0000	10.0000	2.6527	-1.0000
2.0000	10.0000	1.8829	-1.0000
29.0000	10.0000	1.7508	1.0000
6.0000	10.0000	3.8996	1.0000
26.0000	10.0000	1.8904	-1.0000
21.0000	11.0000	2.1661	1.0000
40.0000	10.0000	1.6136	1.0000
31.0000	13.0000	1.7999	-1.0000
15.0000	12.0000	5.5507	-1.0000
13.0000	14.0000	1.3999	1.0000
23.0000	10.0000	1.6811	1.0000
9.0000	10.0000	3.1596	1.0000
8.0000	10.0000	1.7460	-1.0000
39.0000	10.0000	1.9333	-1.0000
34.0000	11.0000	2.4673	1.0000
43.0000	10.0000	1.6494	1.0000
12.0000	11.0000	1.8480	1.0000
32.0000	10.0000	1.3212	1.0000
36.0000	10.0000	1.4134	1.0000
50.0000	10.0000	1.2880	1.0000

S8

24.0000	14.0000	5.4804	1.0000
31.0000	13.0000	2.4694	-1.0000
8.0000	10.0000	1.7220	-1.0000
42.0000	10.0000	3.2557	1.0000
21.0000	11.0000	2.5256	1.0000
25.0000	11.0000	3.9237	1.0000
15.0000	12.0000	3.1347	-1.0000
50.0000	10.0000	2.7035	-1.0000
27.0000	14.0000	4.4326	1.0000
30.0000	12.0000	2.2252	-1.0000
39.0000	10.0000	5.0465	-1.0000
26.0000	10.0000	4.9780	1.0000
2.0000	10.0000	1.7712	-1.0000
29.0000	10.0000	1.8238	1.0000
49.0000	10.0000	3.4421	-1.0000
22.0000	13.0000	2.2432	-1.0000
44.0000	10.0000	1.7859	1.0000
16.0000	13.0000	2.6954	-1.0000
19.0000	14.0000	2.1759	1.0000
36.0000	10.0000	2.8670	-1.0000
48.0000	10.0000	2.2135	1.0000
10.0000	13.0000	2.0042	-1.0000
33.0000	13.0000	2.5654	-1.0000
7.0000	12.0000	2.0572	-1.0000
35.0000	10.0000	4.0297	1.0000
4.0000	10.0000	1.8647	-1.0000
46.0000	10.0000	2.3041	-1.0000
38.0000	10.0000	1.6131	-1.0000
28.0000	12.0000	2.1464	-1.0000
3.0000	11.0000	2.0908	1.0000
11.0000	10.0000	1.7936	-1.0000
40.0000	10.0000	2.6994	-1.0000
43.0000	10.0000	1.7517	1.0000
47.0000	10.0000	4.1845	1.0000
14.0000	10.0000	3.6235	1.0000
32.0000	10.0000	3.0174	1.0000
6.0000	10.0000	4.3214	1.0000
12.0000	11.0000	2.1595	1.0000
23.0000	10.0000	4.2370	1.0000
9.0000	10.0000	3.0223	1.0000
45.0000	10.0000	2.3117	-1.0000
41.0000	10.0000	5.9319	-1.0000
37.0000	10.0000	4.2439	1.0000
5.0000	14.0000	2.5777	1.0000
20.0000	10.0000	2.4391	-1.0000
18.0000	12.0000	3.5813	-1.0000
13.0000	14.0000	2.3044	1.0000
34.0000	11.0000	1.9976	1.0000
17.0000	10.0000	4.4015	-1.0000
1.0000	10.0000	2.7247	1.0000

S9

24.0000	14.0000	1.4345	1.0000
31.0000	13.0000	2.6671	-1.0000
8.0000	10.0000	2.3312	-1.0000
42.0000	10.0000	2.0351	1.0000
21.0000	11.0000	2.6497	1.0000
25.0000	11.0000	2.4793	1.0000
15.0000	12.0000	2.9646	-1.0000
50.0000	10.0000	3.0464	-1.0000
27.0000	14.0000	2.5149	1.0000
30.0000	12.0000	2.0297	-1.0000
39.0000	10.0000	2.7340	1.0000
26.0000	10.0000	2.5918	1.0000
2.0000	10.0000	1.8042	-1.0000
29.0000	10.0000	2.0556	1.0000
49.0000	10.0000	3.9625	-1.0000
22.0000	13.0000	2.2937	-1.0000
44.0000	10.0000	1.9238	1.0000
16.0000	13.0000	2.5585	-1.0000
19.0000	14.0000	2.0027	1.0000
36.0000	10.0000	2.6722	1.0000
48.0000	10.0000	2.0726	1.0000
10.0000	13.0000	2.3574	-1.0000
33.0000	13.0000	2.5042	-1.0000
7.0000	12.0000	3.0725	-1.0000
35.0000	10.0000	3.4629	1.0000
4.0000	10.0000	2.4681	1.0000
46.0000	10.0000	3.9645	-1.0000
38.0000	10.0000	3.5326	-1.0000
28.0000	12.0000	2.4221	-1.0000
3.0000	11.0000	2.4222	1.0000
11.0000	10.0000	4.0400	-1.0000
40.0000	10.0000	5.5270	-1.0000
43.0000	10.0000	1.9018	1.0000
47.0000	10.0000	1.7665	1.0000
14.0000	10.0000	2.2040	1.0000
32.0000	10.0000	2.1813	1.0000
6.0000	10.0000	3.1415	1.0000
12.0000	11.0000	2.4106	1.0000
23.0000	10.0000	1.9101	1.0000
9.0000	10.0000	2.8956	1.0000
45.0000	10.0000	3.3116	-1.0000
41.0000	10.0000	3.0308	-1.0000
37.0000	10.0000	4.3013	1.0000
5.0000	14.0000	2.3498	1.0000
20.0000	10.0000	2.6796	-1.0000
18.0000	12.0000	2.3490	-1.0000
13.0000	14.0000	2.1472	1.0000
34.0000	11.0000	2.3677	1.0000
17.0000	10.0000	4.9384	1.0000
1.0000	10.0000	2.2761	1.0000

S10

42.0000	10.0000	3.6780	1.0000
49.0000	10.0000	5.3056	-1.0000
41.0000	10.0000	6.1950	-1.0000
5.0000	14.0000	3.7763	1.0000
35.0000	10.0000	4.0461	-1.0000
1.0000	10.0000	17.3255	1.0000
44.0000	10.0000	5.0692	1.0000
38.0000	10.0000	3.2937	-1.0000
37.0000	10.0000	7.0246	-1.0000
47.0000	10.0000	2.5733	1.0000
18.0000	12.0000	8.9117	-1.0000
45.0000	10.0000	4.8456	-1.0000
3.0000	11.0000	3.9571	1.0000
22.0000	13.0000	3.8535	-1.0000
19.0000	14.0000	5.3488	1.0000
17.0000	10.0000	5.9891	1.0000
25.0000	11.0000	5.1004	1.0000
7.0000	12.0000	4.4844	-1.0000
28.0000	12.0000	5.4590	-1.0000
48.0000	10.0000	8.5473	1.0000
11.0000	10.0000	3.5834	-1.0000
33.0000	13.0000	9.6540	-1.0000
20.0000	10.0000	5.1980	-1.0000
4.0000	10.0000	3.4503	-1.0000
27.0000	14.0000	7.1550	1.0000
24.0000	14.0000	6.3039	1.0000
10.0000	13.0000	4.2136	-1.0000
30.0000	12.0000	5.9542	-1.0000
14.0000	10.0000	3.7077	1.0000
16.0000	13.0000	9.2012	-1.0000
46.0000	10.0000	6.5817	1.0000
2.0000	10.0000	3.3642	-1.0000
29.0000	10.0000	3.1005	1.0000
6.0000	10.0000	4.4903	1.0000
26.0000	10.0000	3.8719	-1.0000
21.0000	11.0000	3.4377	1.0000
40.0000	10.0000	5.9492	-1.0000
31.0000	13.0000	4.6970	-1.0000
15.0000	12.0000	5.9760	-1.0000
13.0000	14.0000	4.8242	1.0000
23.0000	10.0000	4.3383	1.0000
9.0000	10.0000	3.6431	1.0000
8.0000	10.0000	2.9872	-1.0000
39.0000	10.0000	4.9125	1.0000
34.0000	11.0000	4.0118	1.0000
43.0000	10.0000	2.5566	1.0000
12.0000	11.0000	3.9056	1.0000
32.0000	10.0000	3.0801	1.0000
36.0000	10.0000	7.8803	1.0000
50.0000	10.0000	2.6889	-1.0000

S11

42.0000	10.0000	3.9717	1.0000
49.0000	10.0000	2.2150	-1.0000
41.0000	10.0000	2.5096	-1.0000
5.0000	14.0000	3.7227	-1.0000
35.0000	10.0000	3.9579	1.0000
1.0000	10.0000	2.9976	1.0000
44.0000	10.0000	3.2808	1.0000
38.0000	10.0000	4.1788	-1.0000
37.0000	10.0000	2.3694	-1.0000
47.0000	10.0000	2.5145	1.0000
18.0000	12.0000	4.3065	1.0000
45.0000	10.0000	3.2221	-1.0000
3.0000	11.0000	2.9200	1.0000
22.0000	13.0000	2.3827	-1.0000
19.0000	14.0000	3.6834	1.0000
17.0000	10.0000	4.4018	1.0000
25.0000	11.0000	3.0719	1.0000
7.0000	12.0000	2.5489	-1.0000
28.0000	12.0000	3.1254	-1.0000
48.0000	10.0000	2.5798	1.0000
11.0000	10.0000	5.5447	-1.0000
33.0000	13.0000	2.2362	-1.0000
20.0000	10.0000	4.8617	-1.0000
4.0000	10.0000	6.0092	-1.0000
27.0000	14.0000	2.2450	1.0000
24.0000	14.0000	4.3567	1.0000
10.0000	13.0000	4.3543	-1.0000
30.0000	12.0000	2.5992	-1.0000
14.0000	10.0000	5.1555	1.0000
16.0000	13.0000	4.1586	-1.0000
46.0000	10.0000	4.9784	-1.0000
2.0000	10.0000	3.1607	-1.0000
29.0000	10.0000	2.4133	1.0000
6.0000	10.0000	4.2249	1.0000
26.0000	10.0000	4.3302	1.0000
21.0000	11.0000	3.0451	1.0000
40.0000	10.0000	3.8103	-1.0000
31.0000	13.0000	2.5673	-1.0000
15.0000	12.0000	3.6463	-1.0000
13.0000	14.0000	2.0803	1.0000
23.0000	10.0000	2.5343	1.0000
9.0000	10.0000	2.8525	1.0000
8.0000	10.0000	2.2192	-1.0000
39.0000	10.0000	2.5070	-1.0000
34.0000	11.0000	2.7689	-1.0000
43.0000	10.0000	3.2774	1.0000
12.0000	11.0000	2.7572	1.0000
32.0000	10.0000	2.9480	1.0000
36.0000	10.0000	3.1417	-1.0000
50.0000	10.0000	2.1582	1.0000

S12

24.0000	14.0000	4.1071	1.0000
20.0000	10.0000	3.6755	-1.0000
18.0000	12.0000	3.8776	-1.0000
45.0000	10.0000	3.9649	-1.0000
46.0000	10.0000	3.9161	-1.0000
11.0000	10.0000	2.7979	-1.0000
42.0000	10.0000	1.9777	1.0000
31.0000	13.0000	2.8831	-1.0000
6.0000	10.0000	2.1542	1.0000
38.0000	10.0000	3.3158	-1.0000
22.0000	13.0000	4.9648	1.0000
33.0000	13.0000	2.9178	-1.0000
4.0000	10.0000	10.4479	-1.0000
49.0000	10.0000	3.4664	-1.0000
12.0000	11.0000	2.3002	1.0000
36.0000	10.0000	2.2602	-1.0000
21.0000	11.0000	2.5778	1.0000
2.0000	10.0000	2.7734	-1.0000
5.0000	14.0000	1.8431	1.0000
29.0000	10.0000	2.5431	1.0000
39.0000	10.0000	2.5475	-1.0000
15.0000	12.0000	3.9315	-1.0000
30.0000	12.0000	4.7903	-1.0000
3.0000	11.0000	3.0940	1.0000
9.0000	10.0000	3.2192	1.0000
16.0000	13.0000	3.8620	-1.0000
50.0000	10.0000	2.8412	1.0000
7.0000	12.0000	3.2850	-1.0000
1.0000	10.0000	3.6086	1.0000
19.0000	14.0000	3.6672	1.0000
47.0000	10.0000	2.1543	1.0000
44.0000	10.0000	3.5953	1.0000
48.0000	10.0000	2.8352	1.0000
10.0000	13.0000	2.9655	-1.0000
32.0000	10.0000	3.1960	1.0000
14.0000	10.0000	2.4325	1.0000
41.0000	10.0000	2.2766	1.0000
35.0000	10.0000	4.7816	1.0000
37.0000	10.0000	2.6837	1.0000
8.0000	10.0000	2.3413	-1.0000
25.0000	11.0000	2.4185	1.0000
13.0000	14.0000	2.0278	1.0000
28.0000	12.0000	3.6270	-1.0000
17.0000	10.0000	1.7944	1.0000
43.0000	10.0000	2.8069	1.0000
23.0000	10.0000	1.8711	1.0000
40.0000	10.0000	4.1083	1.0000
34.0000	11.0000	2.7407	1.0000
26.0000	10.0000	2.7920	1.0000
27.0000	14.0000	2.6186	1.0000

S13

24.0000	14.0000	7.1815	-1.0000
31.0000	13.0000	2.6305	-1.0000
8.0000	10.0000	3.2499	-1.0000
42.0000	10.0000	2.6281	1.0000
21.0000	11.0000	3.8471	1.0000
25.0000	11.0000	7.7258	1.0000
15.0000	12.0000	3.9293	-1.0000
50.0000	10.0000	4.0312	-1.0000
27.0000	14.0000	2.6530	1.0000
30.0000	12.0000	4.5515	-1.0000
39.0000	10.0000	5.6102	-1.0000
26.0000	10.0000	2.9845	-1.0000
2.0000	10.0000	3.4693	-1.0000
29.0000	10.0000	3.0703	1.0000
49.0000	10.0000	2.7127	-1.0000
22.0000	13.0000	4.6281	-1.0000
44.0000	10.0000	2.4377	1.0000
16.0000	13.0000	2.4934	-1.0000
19.0000	14.0000	4.6432	1.0000
36.0000	10.0000	7.8300	-1.0000
48.0000	10.0000	3.8920	1.0000
10.0000	13.0000	2.9776	-1.0000
33.0000	13.0000	3.6701	-1.0000
7.0000	12.0000	5.2312	1.0000
35.0000	10.0000	6.3805	1.0000
4.0000	10.0000	2.6273	-1.0000
46.0000	10.0000	7.1682	-1.0000
38.0000	10.0000	5.4304	-1.0000
28.0000	12.0000	5.1892	-1.0000
3.0000	11.0000	2.2662	1.0000
11.0000	10.0000	3.7889	-1.0000
40.0000	10.0000	3.6429	-1.0000
43.0000	10.0000	3.2564	1.0000
47.0000	10.0000	2.2185	1.0000
14.0000	10.0000	1.7887	1.0000
32.0000	10.0000	1.8807	1.0000
6.0000	10.0000	1.7908	1.0000
12.0000	11.0000	4.5154	1.0000
23.0000	10.0000	3.0722	1.0000
9.0000	10.0000	6.0988	1.0000
45.0000	10.0000	2.6838	1.0000
41.0000	10.0000	5.7755	1.0000
37.0000	10.0000	1.9912	-1.0000
5.0000	14.0000	3.1676	1.0000
20.0000	10.0000	4.6812	-1.0000
18.0000	12.0000	2.3499	-1.0000
13.0000	14.0000	3.1114	1.0000
34.0000	11.0000	2.1632	1.0000
17.0000	10.0000	2.3633	1.0000
1.0000	10.0000	3.4238	1.0000

S14

42.0000	10.0000	3.8587	1.0000
49.0000	10.0000	2.5320	-1.0000
41.0000	10.0000	4.5869	-1.0000
5.0000	14.0000	2.5165	1.0000
35.0000	10.0000	3.4559	1.0000
1.0000	10.0000	3.5264	1.0000
44.0000	10.0000	5.1337	1.0000
38.0000	10.0000	3.3089	-1.0000
37.0000	10.0000	5.6160	-1.0000
47.0000	10.0000	2.4999	1.0000
18.0000	12.0000	3.1846	-1.0000
45.0000	10.0000	3.5011	-1.0000
3.0000	11.0000	2.7740	1.0000
22.0000	13.0000	4.5918	-1.0000
19.0000	14.0000	3.1752	1.0000
17.0000	10.0000	5.2615	1.0000
25.0000	11.0000	2.7874	1.0000
7.0000	12.0000	3.7023	-1.0000
28.0000	12.0000	3.1299	-1.0000
48.0000	10.0000	6.1952	1.0000
11.0000	10.0000	5.1834	-1.0000
33.0000	13.0000	2.5707	-1.0000
20.0000	10.0000	2.9177	-1.0000
4.0000	10.0000	2.7579	-1.0000
27.0000	14.0000	6.5020	-1.0000
24.0000	14.0000	3.2072	1.0000
10.0000	13.0000	4.0756	-1.0000
30.0000	12.0000	3.5895	-1.0000
14.0000	10.0000	2.4707	1.0000
16.0000	13.0000	5.4353	-1.0000
46.0000	10.0000	2.9306	1.0000
2.0000	10.0000	2.7537	-1.0000
29.0000	10.0000	2.2733	1.0000
6.0000	10.0000	3.7997	1.0000
26.0000	10.0000	3.2024	-1.0000
21.0000	11.0000	2.1925	1.0000
40.0000	10.0000	5.6840	1.0000
31.0000	13.0000	2.9974	-1.0000
15.0000	12.0000	5.0641	-1.0000
13.0000	14.0000	4.0921	1.0000
23.0000	10.0000	3.2185	1.0000
9.0000	10.0000	2.5992	1.0000
8.0000	10.0000	2.4662	-1.0000
39.0000	10.0000	3.2000	-1.0000
34.0000	11.0000	2.8328	1.0000
43.0000	10.0000	2.7998	1.0000
12.0000	11.0000	5.0636	1.0000
32.0000	10.0000	2.7879	1.0000
36.0000	10.0000	9.0487	1.0000
50.0000	10.0000	7.2976	1.0000

S15

24.0000	14.0000	4.9211	1.0000
31.0000	13.0000	3.9183	-1.0000
8.0000	10.0000	3.9058	-1.0000
42.0000	10.0000	3.3967	1.0000
21.0000	11.0000	3.3193	1.0000
25.0000	11.0000	3.5670	1.0000
15.0000	12.0000	5.8870	-1.0000
50.0000	10.0000	4.5360	1.0000
27.0000	14.0000	3.9904	1.0000
30.0000	12.0000	5.9721	-1.0000
39.0000	10.0000	3.3418	1.0000
26.0000	10.0000	4.9536	-1.0000
2.0000	10.0000	5.9876	-1.0000
29.0000	10.0000	3.0148	1.0000
49.0000	10.0000	5.0116	-1.0000
22.0000	13.0000	4.3626	-1.0000
44.0000	10.0000	3.2774	1.0000
16.0000	13.0000	5.1770	-1.0000
19.0000	14.0000	3.0299	1.0000
36.0000	10.0000	8.7695	-1.0000
48.0000	10.0000	5.2347	1.0000
10.0000	13.0000	6.5715	-1.0000
33.0000	13.0000	3.9689	-1.0000
7.0000	12.0000	4.5111	-1.0000
35.0000	10.0000	3.8277	1.0000
4.0000	10.0000	4.9310	-1.0000
46.0000	10.0000	6.4075	-1.0000
38.0000	10.0000	5.8018	-1.0000
28.0000	12.0000	5.5632	-1.0000
3.0000	11.0000	2.7383	1.0000
11.0000	10.0000	3.9262	-1.0000
40.0000	10.0000	3.2764	1.0000
43.0000	10.0000	2.7732	1.0000
47.0000	10.0000	2.5351	1.0000
14.0000	10.0000	3.5402	1.0000
32.0000	10.0000	3.4418	1.0000
6.0000	10.0000	3.2551	1.0000
12.0000	11.0000	4.0457	1.0000
23.0000	10.0000	3.4176	1.0000
9.0000	10.0000	3.7103	1.0000
45.0000	10.0000	4.8316	-1.0000
41.0000	10.0000	5.5071	-1.0000
37.0000	10.0000	5.4295	1.0000
5.0000	14.0000	3.3499	1.0000
20.0000	10.0000	4.7096	-1.0000
18.0000	12.0000	3.4915	-1.0000
13.0000	14.0000	3.2024	1.0000
34.0000	11.0000	2.8131	1.0000
17.0000	10.0000	7.3801	-1.0000
1.0000	10.0000	2.6798	1.0000

S16

42.0000	10.0000	3.8174	1.0000
49.0000	10.0000	1.9568	-1.0000
41.0000	10.0000	2.0194	-1.0000
5.0000	14.0000	1.7019	1.0000
35.0000	10.0000	3.5220	1.0000
1.0000	10.0000	2.0720	1.0000
44.0000	10.0000	3.4599	-1.0000
38.0000	10.0000	2.1681	-1.0000
37.0000	10.0000	3.5849	1.0000
47.0000	10.0000	1.4986	1.0000
18.0000	12.0000	2.4638	-1.0000
45.0000	10.0000	6.1459	-1.0000
3.0000	11.0000	2.3155	1.0000
22.0000	13.0000	2.5471	-1.0000
19.0000	14.0000	2.3618	1.0000
17.0000	10.0000	2.0418	1.0000
25.0000	11.0000	2.7946	1.0000
7.0000	12.0000	2.4612	-1.0000
28.0000	12.0000	2.0840	-1.0000
48.0000	10.0000	4.2094	-1.0000
11.0000	10.0000	4.1959	-1.0000
33.0000	13.0000	2.9018	-1.0000
20.0000	10.0000	3.5310	-1.0000
4.0000	10.0000	2.2703	-1.0000
27.0000	14.0000	1.8088	1.0000
24.0000	14.0000	4.6367	1.0000
10.0000	13.0000	2.6183	-1.0000
30.0000	12.0000	2.9476	-1.0000
14.0000	10.0000	1.8428	1.0000
16.0000	13.0000	3.5222	-1.0000
46.0000	10.0000	7.5123	-1.0000
2.0000	10.0000	2.1882	-1.0000
29.0000	10.0000	3.3875	1.0000
6.0000	10.0000	2.5391	1.0000
26.0000	10.0000	2.8601	-1.0000
21.0000	11.0000	1.7029	1.0000
40.0000	10.0000	3.0727	1.0000
31.0000	13.0000	2.7170	-1.0000
15.0000	12.0000	2.8504	-1.0000
13.0000	14.0000	1.6076	1.0000
23.0000	10.0000	2.3314	1.0000
9.0000	10.0000	2.4530	1.0000
8.0000	10.0000	1.8050	-1.0000
39.0000	10.0000	5.9500	-1.0000
34.0000	11.0000	2.6260	1.0000
43.0000	10.0000	2.7051	1.0000
12.0000	11.0000	1.7458	1.0000
32.0000	10.0000	2.2422	1.0000
36.0000	10.0000	3.9697	-1.0000
50.0000	10.0000	3.3060	1.0000

S17				S18			
24.0000	14.0000	3.1656	1.0000	42.0000	10.0000	3.0509	1.0000
20.0000	10.0000	2.7033	-1.0000	49.0000	10.0000	2.8095	-1.0000
18.0000	12.0000	2.7074	-1.0000	41.0000	10.0000	3.8182	1.0000
45.0000	10.0000	2.3141	1.0000	5.0000	14.0000	3.1277	1.0000
46.0000	10.0000	1.8500	-1.0000	35.0000	10.0000	3.6896	1.0000
11.0000	10.0000	1.9958	-1.0000	1.0000	10.0000	4.4072	-1.0000
42.0000	10.0000	1.8266	1.0000	44.0000	10.0000	2.6067	-1.0000
31.0000	13.0000	1.7585	-1.0000	38.0000	10.0000	2.8815	-1.0000
6.0000	10.0000	1.4081	1.0000	37.0000	10.0000	3.7826	-1.0000
38.0000	10.0000	1.6705	-1.0000	47.0000	10.0000	2.2658	1.0000
22.0000	13.0000	2.4278	-1.0000	18.0000	12.0000	2.5073	-1.0000
33.0000	13.0000	2.2272	-1.0000	45.0000	10.0000	2.6263	-1.0000
4.0000	10.0000	1.8436	-1.0000	3.0000	11.0000	3.7369	1.0000
49.0000	10.0000	2.6932	-1.0000	22.0000	13.0000	2.6956	-1.0000
12.0000	11.0000	2.0530	1.0000	19.0000	14.0000	2.7802	1.0000
36.0000	10.0000	1.4220	-1.0000	17.0000	10.0000	3.0730	-1.0000
21.0000	11.0000	2.3265	1.0000	25.0000	11.0000	2.8571	1.0000
2.0000	10.0000	1.4682	-1.0000	7.0000	12.0000	2.4460	-1.0000
5.0000	14.0000	1.6602	1.0000	28.0000	12.0000	2.6375	-1.0000
29.0000	10.0000	1.2660	1.0000	48.0000	10.0000	2.1008	-1.0000
39.0000	10.0000	2.0664	1.0000	11.0000	10.0000	5.7716	-1.0000
15.0000	12.0000	2.8303	-1.0000	33.0000	13.0000	1.9737	-1.0000
30.0000	12.0000	1.4787	-1.0000	20.0000	10.0000	2.6399	-1.0000
3.0000	11.0000	1.6832	1.0000	4.0000	10.0000	1.8141	-1.0000
9.0000	10.0000	1.8975	1.0000	27.0000	14.0000	3.8272	-1.0000
16.0000	13.0000	2.4598	-1.0000	24.0000	14.0000	3.1667	1.0000
50.0000	10.0000	1.3464	-1.0000	10.0000	13.0000	3.1197	-1.0000
7.0000	12.0000	1.8357	-1.0000	30.0000	12.0000	3.2743	-1.0000
1.0000	10.0000	1.7257	1.0000	14.0000	10.0000	2.6152	1.0000
19.0000	14.0000	2.2344	1.0000	16.0000	13.0000	2.4268	-1.0000
47.0000	10.0000	1.6923	1.0000	46.0000	10.0000	2.5010	-1.0000
44.0000	10.0000	1.4233	1.0000	2.0000	10.0000	1.5955	-1.0000
48.0000	10.0000	1.6013	1.0000	29.0000	10.0000	2.2380	1.0000
10.0000	13.0000	1.9481	-1.0000	6.0000	10.0000	2.1987	1.0000
32.0000	10.0000	1.6924	1.0000	26.0000	10.0000	2.6541	-1.0000
14.0000	10.0000	1.6938	1.0000	21.0000	11.0000	2.5950	1.0000
41.0000	10.0000	2.5936	1.0000	40.0000	10.0000	2.6967	-1.0000
35.0000	10.0000	1.6784	-1.0000	31.0000	13.0000	4.6557	1.0000
37.0000	10.0000	1.5536	1.0000	15.0000	12.0000	6.0423	-1.0000
8.0000	10.0000	1.7862	-1.0000	13.0000	14.0000	2.1570	1.0000
25.0000	11.0000	1.6072	1.0000	23.0000	10.0000	2.1938	1.0000
13.0000	14.0000	1.1713	1.0000	9.0000	10.0000	2.7261	1.0000
28.0000	12.0000	1.7107	-1.0000	8.0000	10.0000	1.6247	-1.0000
17.0000	10.0000	1.9459	1.0000	39.0000	10.0000	2.7582	-1.0000
43.0000	10.0000	1.7815	1.0000	34.0000	11.0000	3.2214	1.0000
23.0000	10.0000	1.7723	1.0000	43.0000	10.0000	2.2762	1.0000
40.0000	10.0000	2.8024	-1.0000	12.0000	11.0000	1.9949	1.0000
34.0000	11.0000	1.5920	1.0000	32.0000	10.0000	4.2026	1.0000
26.0000	10.0000	1.9480	1.0000	36.0000	10.0000	3.3082	-1.0000
27.0000	14.0000	1.8922	1.0000	50.0000	10.0000	1.9793	-1.0000

S19

40.0000	10.0000	4.3060	1.0000
20.0000	10.0000	3.9822	-1.0000
8.0000	10.0000	3.3507	-1.0000
42.0000	10.0000	3.5409	1.0000
7.0000	12.0000	2.9699	-1.0000
21.0000	11.0000	2.7594	1.0000
29.0000	10.0000	2.7573	1.0000
13.0000	14.0000	3.2509	1.0000
28.0000	12.0000	2.6259	-1.0000
30.0000	12.0000	3.2846	-1.0000
48.0000	10.0000	2.8108	1.0000
15.0000	12.0000	3.3608	-1.0000
12.0000	11.0000	2.7898	1.0000
41.0000	10.0000	3.6901	1.0000
3.0000	11.0000	2.9143	1.0000
2.0000	10.0000	5.5634	-1.0000
27.0000	14.0000	2.9302	1.0000
4.0000	10.0000	3.5210	-1.0000
5.0000	14.0000	2.4696	1.0000
47.0000	10.0000	1.9794	1.0000
38.0000	10.0000	3.0167	-1.0000
31.0000	13.0000	2.6646	-1.0000
23.0000	10.0000	2.8407	1.0000
1.0000	10.0000	3.6118	1.0000
37.0000	10.0000	5.8449	1.0000
36.0000	10.0000	6.7317	-1.0000
9.0000	10.0000	3.0605	1.0000
35.0000	10.0000	2.6296	1.0000
33.0000	13.0000	2.8938	-1.0000
46.0000	10.0000	4.0904	-1.0000
6.0000	10.0000	3.0630	1.0000
49.0000	10.0000	6.5152	-1.0000
16.0000	13.0000	5.4341	1.0000
44.0000	10.0000	2.8170	1.0000
18.0000	12.0000	5.3929	-1.0000
26.0000	10.0000	3.8512	1.0000
43.0000	10.0000	2.6398	1.0000
50.0000	10.0000	5.0863	1.0000
25.0000	11.0000	2.6713	1.0000
34.0000	11.0000	2.7809	1.0000
22.0000	13.0000	3.5052	-1.0000
32.0000	10.0000	3.0727	1.0000
10.0000	13.0000	3.8547	-1.0000
19.0000	14.0000	2.8800	1.0000
14.0000	10.0000	3.9013	1.0000
24.0000	14.0000	3.4206	1.0000
39.0000	10.0000	4.7322	1.0000
11.0000	10.0000	6.3509	-1.0000
17.0000	10.0000	5.4960	1.0000
45.0000	10.0000	6.1044	1.0000

S20

5.0000	14.0000	4.6764	-1.0000
12.0000	11.0000	3.0331	-1.0000
13.0000	14.0000	3.0252	1.0000
3.0000	11.0000	2.6322	1.0000
9.0000	10.0000	4.6889	1.0000
2.0000	10.0000	3.3683	-1.0000
43.0000	10.0000	4.0697	1.0000
16.0000	13.0000	3.3637	-1.0000
44.0000	10.0000	6.4473	-1.0000
21.0000	11.0000	2.8105	1.0000
8.0000	10.0000	2.4558	-1.0000
31.0000	13.0000	3.7119	-1.0000
25.0000	11.0000	2.7334	1.0000
49.0000	10.0000	3.6617	-1.0000
48.0000	10.0000	4.2159	1.0000
14.0000	10.0000	3.4889	1.0000
46.0000	10.0000	3.8018	-1.0000
41.0000	10.0000	4.4386	-1.0000
38.0000	10.0000	2.5753	-1.0000
42.0000	10.0000	3.1014	1.0000
36.0000	10.0000	4.0531	-1.0000
35.0000	10.0000	3.8484	-1.0000
4.0000	10.0000	2.3889	-1.0000
24.0000	14.0000	3.2775	1.0000
17.0000	10.0000	5.6658	1.0000
6.0000	10.0000	3.2702	1.0000
23.0000	10.0000	3.7437	1.0000
32.0000	10.0000	2.5300	1.0000
1.0000	10.0000	2.2440	1.0000
22.0000	13.0000	3.1242	-1.0000
29.0000	10.0000	3.1973	1.0000
30.0000	12.0000	3.6554	-1.0000
15.0000	12.0000	4.4103	-1.0000
11.0000	10.0000	4.2586	-1.0000
10.0000	13.0000	2.8609	-1.0000
18.0000	12.0000	3.2328	-1.0000
45.0000	10.0000	3.8533	-1.0000
26.0000	10.0000	6.7565	-1.0000
7.0000	12.0000	2.4412	-1.0000
20.0000	10.0000	4.6604	-1.0000
27.0000	14.0000	2.3604	1.0000
33.0000	13.0000	2.5439	-1.0000
19.0000	14.0000	3.4552	1.0000
28.0000	12.0000	6.0743	-1.0000
39.0000	10.0000	5.7665	1.0000
47.0000	10.0000	2.0875	1.0000
37.0000	10.0000	2.8718	1.0000
34.0000	11.0000	2.9254	1.0000
40.0000	10.0000	4.2853	1.0000
50.0000	10.0000	2.5386	-1.0000

SUBJECT ANSWERS FOR SENTENCE TYPE

RPY	RPN	RDY	RDN	IPY	IPN	IDY	IDN	
5.0000	0	0	5.0000	0	5.0000	4.0000	1.0000	s1
5.0000	0	2.0000	3.0000	0	5.0000	5.0000	0	s2
4.0000	1.0000	0	5.0000	0	5.0000	4.0000	1.0000	s3
5.0000	0	0	5.0000	1.0000	4.0000	5.0000	0	s4
5.0000	0	0	5.0000	1.0000	4.0000	4.0000	1.0000	s5
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s6
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s7
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s8
5.0000	0	0	5.0000	0	5.0000	4.0000	1.0000	s9
5.0000	0	1.0000	4.0000	0	5.0000	4.0000	1.0000	s10
5.0000	0	0	5.0000	1.0000	4.0000	5.0000	0	s11
4.0000	1.0000	1.0000	4.0000	0	5.0000	4.0000	1.0000	s12
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s13
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s14
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s15
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s16
5.0000	0	0	5.0000	2.0000	3.0000	5.0000	0	s17
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s18
4.0000	1.0000	0	5.0000	0	5.0000	5.0000	0	s19
5.0000	0	0	5.0000	0	5.0000	5.0000	0	s20

SUBJECT MEANS OF RT DIFFERENCES FOR SENTENCE TYPE

RT-RPY	RT-RPN	RT-RDY	RT-RDN	RT-IPY	RT-IPN	RT-IDY	RT-IDN
6.2850	NaN	NaN	5.8367	NaN	7.2779	4.4568	7.4758
3.0713	NaN	4.3269	3.2234	NaN	3.7774	3.0348	NaN
2.7754	3.0331	NaN	3.9628	NaN	3.1209	3.0296	4.6764
2.7832	NaN	NaN	3.5268	5.4341	3.2296	2.9902	NaN
2.8811	NaN	NaN	3.3815	4.6557	2.5540	2.8079	3.8272
1.8524	NaN	NaN	2.1126	NaN	2.1643	2.0247	NaN
2.2370	NaN	NaN	2.5614	NaN	2.8613	2.4234	NaN
3.2967	NaN	NaN	5.0850	NaN	4.7997	3.6987	NaN
3.1301	NaN	NaN	3.7341	NaN	3.9341	3.2478	6.5020
4.1035	NaN	5.2312	4.0050	NaN	3.2799	3.3938	7.1815
2.6262	NaN	NaN	3.9023	4.9648	3.1571	2.8528	NaN
2.9486	2.7689	4.3065	2.9799	NaN	3.1398	3.0913	3.7227
4.0825	NaN	NaN	6.1571	NaN	6.3238	5.4816	NaN
2.4659	NaN	NaN	2.5676	NaN	2.4762	2.0898	NaN
2.5394	NaN	NaN	2.6290	NaN	2.3955	3.3942	NaN
2.1228	NaN	NaN	3.2249	NaN	2.2314	2.1948	NaN
1.9679	NaN	NaN	2.7307	4.4620	2.3781	2.0757	NaN
3.1004	NaN	NaN	3.6654	NaN	4.9678	4.0468	NaN
4.4312	3.5492	NaN	4.4300	NaN	3.3676	4.8703	NaN
6.0960	NaN	NaN	4.8800	NaN	6.0424	7.4172	NaN

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